NZS 4510:2008

Incorporating Amendment No. 1

New Zealand Standard

Fire hydrant systems for buildings

Superseding NZS 4510:1998

NZS 4510:2008

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COMMITTEE REPRESENTATION

This Standard was prepared under the supervision of the P 4510 Committee the Standards Council established under the Standards Act 1988.

The committee consisted of representatives of the following nominating organisations:

BRANZ Ltd
Corporation of Insurance Brokers
Department of Building and Housing
Fire Inspection Services
Fire Protection Association
Fire Protection Contractors' Association
Insurance Council of New Zealand
IPENZ
Local Government New Zealand
New Zealand Fire Equipment Manufacturers' Association
New Zealand Fire Service
and other individuals who were co-opted onto the committee by Standards New Zealand.

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AMENDMENTS

No.	*Date of issue*	*Description*	*Entered by, and date*
1	30 January 2009	Aligns NZS 4510:2008 with the Compliance Documents to the New Zealand Building Code and updates the referenced documents to incorporate the most recently published Standards	Incorporated in this edition

NZS 4510:2008

New Zealand Standard

Fire hydrant systems for buildings

Superseding NZS 4510:1998

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VALUE STATEMENT

NZS 4510 will continue to prevent loss of life and provide protection of property for all New Zealanders and enhanced safety for firefighters by ensuring the facilities to apply water for firefighting are available in large buildings.

REFERENCED DOCUMENTS

Reference is made in this document to the following:

NEW ZEALAND STANDARDS AND SPECIFICATIONS

NZS 1170:- - - -	Structural design actions
Part 5:2004	Earthquake actions – New Zealand
NZS/BS 1387:1985	Specification for screwed and socketed steel tubes and tubulars and for plain end steel tubes suitable for welding or for screwing to BS 21 pipe threads
NZS 3404:- - - -	Steel structures Standard
Part 1:1997	Steel structures Standard
Part 2:1997	Commentary to the steel structures Standard
NZS 3501:1976	Specification for copper tubes for water, gas, and sanitation
NZS 3603:1993	Timber structures Standard
NZS 4219:1983	Specification for seismic resistance of engineering systems in buildings
NZS 4510:1998	Fire hydrant systems for buildings
NZS 4510:1978	Riser mains for fire service use
NZS 4515:2003	Fire sprinkler systems for residential occupancies
NZS 4541:2007	Automatic fire sprinkler systems
NZS 4711:1984	Qualification tests for metal-arc welders
NZS 5807:1980	Code of practice for industrial identification by colour, wording or other coding
SNZ PAS 4505:2007	Firefighting waterway equipment
SNZ PAS 4509:2008	New Zealand Fire Service firefighting water supplies code of practice

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JOINT AUSTRALIAN/NEW ZEALAND STANDARDS

AS/NZS 1221:1997	Fire hose reels
AS/NZS 2980:2007	Qualification of welders for fusion welding of steels
AS/NZS 3013:2005	Electrical installations – Classification of the fire and mechanical performance of wiring system elements
AS/NZS 4130:2003	Polyethylene (PE) pipes for pressure applications
AS/NZS ISO/IEC 17020:2000	General criteria for the operation of various types of bodies performing inspection

INTERNATIONAL STANDARD

IEC 60947:- - - -	Low voltage switchgear and control gear
Part 4:1990	Contactors and motor-starters

AUSTRALIAN STANDARDS

AS 1074:1989	Steel tubes and tubulars for ordinary service
AS 1432:2004	Copper tubes for plumbing, gasfitting and drainage applications
AS 1572:1998	Copper and copper alloys – Seamless tubes for engineering purposes
AS 2149:2003	Starter batteries – Lead-acid
AS 4041:2006	Pressure piping
AS 4809:2003	Copper pipe and fittings – Installation and commissioning
AS 60529:2004	Degrees of protection provided by enclosures (IP Code)
SA HB 20:1996	Graphical symbols for fire protection drawings

AMERICAN STANDARD

Amd No. 1 Jan. '09

Amd No. 1 Jan. '09

ASTM A106/A106M 2008	Standard specification for seamless carbon steel pipe for high-temperature service
ASTM A312/A312M 2008	Standard specification for seamless, welded, and heavily cold worked austenitic stainless steel pipes
ASTM A380 2006	Standard practice for cleaning, descaling, and passivation of stainless steel parts, equipmment, and systems

BRITISH STANDARDS

BS EN 837-1:1998	Pressure gauges. Bourdon tube pressure gauge dimensions, metrology requirements and testing
BS 2971:1991	Specification for class II arc welding of carbon steel pipework for carrying fluids
BS ISO 3046:- - - -	Reciprocating internal combustion engines. Performance.
Part 1:2002	Declarations of power, fuel and lubricating oil consumptions, and test methods. Additional requirements for engines for general use
BS 4677:1984	Specification for arc welding of austenitic stainless steel pipework for carrying fluids
BS 5252:1976	Framework for colour co-ordination for building purposes

GERMAN STANDARD

DIN 16005:1995	General purpose pressure gauges with elastic pressure response elements; requirements and testing

OTHER PUBLICATIONS

API Spec 5L:2004	Specification for line pipe
New Zealand Fire Service, Region 1	Interim Code of Practice for Charged Riser Compliance 1990
New Zealand Fire Service	A guide to fire service operations in buildings (draft). Christchurch: NZFS, 2007
Department of Building and Housing	New Zealand Building Code Compliance documents of the New Zealand Building Code

NEW ZEALAND LEGISLATION

Building Act 2004
Building (Forms) Regulations 2004
Building Regulations 1992
Electricity Regulations 1997
Fire Service Act 1975
Hazardous Substances and New Organisms (HSNO) Act 1996

LATEST REVISIONS

The users of this Standard should ensure that their copies of the above-mentioned New Zealand Standards and legislation are the latest revisions or include the latest amendments. Amendments to referenced New Zealand and Joint Australian/New Zealand Standards can be found on **www.standards.co.nz.**

FOREWORD

This revision of NZS 4510 introduces a number of changes to the 1998 edition of the Standard.

The purpose of this Standard is to set out minimum technical and performance requirements for fire hydrant systems installed in buildings. Hydrant systems are primarily for fire service use when attending and dealing with fire emergencies in buildings.

Accepting that demands on internal building hydrant systems are likely to be less for sprinkler-protected buildings, than for buildings without sprinklers is the most significant area of change from the previous edition of the Standard. Given this, the demands for internal hydrant systems have been aligned with those specified under SNZ PAS 4509 New Zealand Fire Service fire fighting water supplies code of practice, with a maximum flow rate of 1500 L/min for buildings fitted with approved sprinkler systems. The demands for buildings not equipped with approved sprinkler systems have not changed from those specified in the 1998 edition of the Standard. The committee preparing this Standard considered the possibility of combining sprinkler and hydrant risers. It was recognised, however, that a level of redundancy was required for riser systems, for the rare occasions when sprinkler systems are decommissioned for maintenance or alterations.

The building hydrant outlet design criteria, which were contentious in preparing the 1998 Standard were reconsidered. The design criteria of the 1998 edition of the Standard were reconfirmed for unsprinklered buildings, and for sprinklered buildings, the flow rates were slightly adjusted to allow them to be aligned to the requirements recommended in SNZ/PAS 4509.

The Standard introduces a checklist in an appendix to provide guidance for pump installations (see Appendix F). In addition, the Standard also provides information on the provision of hydrants to protect low-rise buildings (see Appendix C). Given that this is a new addition to the Standard, the committee decided to make this appendix informative, (that is, not mandatory) rather than normative (mandatory). The Standard is expected to be next reviewed around 2018, and at that stage, with experiences over a ten-year period, it is expected that this appendix will be expanded and made normative. Amd No. 1 Jan. '09

This Standard recognises the value of sprinklers in reducing the overall fire risk in buildings. For this reason the hydrant requirements are relaxed where a sprinkler system is installed in the building. Users of this Standard should be aware that in the event of sprinkler system failure the level of performance of the hydrant system may not be sufficient to meet the design objectives of the system. Concerns over the reliability of the sprinkler system or the adverse consequences of system failure may require additional consideration in the design of the system. It is recommended to users of this Standard that if a system is being installed (fully or in part) to meet property protection requirements that advice is taken from key stakeholders which would be expected to include the insurers of the protected building.

Although an adequate water supply is necessary, the Standard does not require a water supply sufficient for firefighting to be permanently piped to the hydrant system. Since the purpose of the hydrant system is to provide for fire service use, it is assumed that as with any other building, the fire service will, on arrival, access the available water supply and couple-in to the riser system. However, in some industrial buildings for example, the owner may opt to provide a permanently piped supply for use by a private fire brigade. The Standard permits this and provides appropriate criteria.

On multi-storeyed buildings where the combination of pressure loss due to height (static) and friction means that fire service pumps cannot meet the performance criteria pressure at the highest building hydrant outlet, booster pumps are required. The Standard provides for the National Commander of the New Zealand Fire Service to declare the highest fire service pumping pressure to be used in calculating whether pumps are necessary (see Appendix D).

Particular attention has been given to the problem of pressure control at the various levels within multi-storeyed buildings. It is important that firefighters are not confronted with excessively high pressures. Requirements have been included the setting, calibration, and testing of pressure control valves in an effort to overcome the very serious problems that have arisen in overseas fires as a result of incorrectly set valves.

The Standard provides incentives to recognise the advantages (for firefighter safety and operational efficiency) of locating building hydrant outlets in multi-storeyed buildings within a protected lobby. Location within stairwells, while permissible, creates congestion in a fire, and reduces the effective reach of standard length hose lines because of the need to base the fire attack from the landing below.

In preparing this Standard, the committee considered the frequency of flow testing of pump units that is required. As there are limited records of testing results it would be appreciated if all testing authorities conducting tests under this Standard would forward a copy of the test results to Standards New Zealand, so that trends over time can be considered in the next revision. These can be sent to the General Manager, Standards Development.

Internal building hydrant systems need to be operational during both construction and demolition periods – both activities provide a heightened risk of fire. The Standard specifies that during construction, the hydrant system must be enlivened progressively (including pumps, if required) as construction advances.

The correct operation and function of these systems during a fire may be of critical importance to firefighting safety. The Standard therefore assumes that the hydrant system certifier, the designer, and the contractor installing the system have appropriate technical competencies and experience. It is anticipated that the recommendation that a hydrant system certifier be an accredited body will become a mandatory requirement at the next revision. On certain matters consultation with the New Zealand Fire Service at the design stage (section 3) is mandatory as is notification of planned impairments (section 9) during the operating life of the system.

NEW ZEALAND STANDARD

FIRE HYDRANT SYSTEMS FOR BUILDINGS

1 GENERAL

1.1 SCOPE

1.1.1 This Standard specifies requirements for the design, installation, commissioning, and testing of building hydrant systems.

1.1.2 The primary purpose of the system shall be to allow water supplied by fire service pumping appliances to the inlet to be reticulated to building hydrant outlets within the building and located to facilitate and ensure reasonable safety for fire service operations. Where the pressure available from fire service pumps is not able to deliver the nominated flows at the building hydrant outlets within the permitted pressure ranges, pumps shall be required to achieve those flows. It may be necessary to ensure that pressure ranges are not exceeded.

1.1.3 The type of system shall, unless otherwise approved by the hydrant system certifier, be a wet-pipe system, charged and pressurised with water to ensure the integrity of the system and maintained in this condition. The water supply for firefighting shall normally be supplied by the fire service through the building hydrant inlet.

1.1.4 An optional secondary purpose which may be allowed, is the reticulation of firefighting water for use by staff, prior to the arrival of the fire service. In such cases, the hydrant system may be supplied with a permanently connected pressurised water source sufficient to allow staff to establish hose streams direct from the hydrant system outlets. Use of this secondary option shall not diminish the primary objective of the Standard.

1.1.5 Building hydrant systems complying with this Standard are suited to firefighting operations using manually controlled branches.

1.1.6 Systems designed to this Standard are not suitable for the use of automatic branches, that is, those which optimise flow rate in order to maintain a constant nozzle pressure.

1.1.7 Riser systems may be installed to superseded Standards, see Appendix A for information.

1.2 OBJECTIVE

The objective of this Standard is to provide specifiers, users, manufacturers, suppliers, installers, and maintenance persons with requirements and guidance to assist in the design, construction, and maintenance of a building hydrant system for a building, that will aid fire service firefighting operations within the building during construction, normal operation, and demolition.

1.3 DEFINITIONS

1.3.1 For the purposes of this Standard the following definitions shall apply:

Approved

Approved by the building consent authority (BCA) in accordance with the New Zealand Building Code (NZBC)

NOTE – The hydrant system certifier is expected to provide evidence to the BCA that the installation meets the requirements of this Standard.

Approved sprinkler system

A sprinkler system that has been approved by a sprinkler system certifier to comply with NZS 4541 or NZS 4515

NOTE –

(1) The intention is to ensure that the reliability of the sprinkler system water supplies complies with published sprinkler Standards.

(2) A BCA may accept a sprinkler system complying with other Standards as an Alternative Solution to these nominated Standards.

Building hydrant inlet (BHI)

An assembly located at an external location connected to the hydrant system through pipework and comprising male hose couplings, clapper valves, and ancillary equipment, for the purposes of allowing the fire service to pump water into the hydrant system

Building hydrant outlet assembly

An assembly connected to the building hydrant system comprising two valves each with female hose couplings and related fittings (including an enclosure where provided) to allow water to be supplied from the hydrant system through fire service hoses

Certified hydrant system

A hydrant system installed to this Standard

Design engineer

A person who, on the basis of experience or qualifications, and their fundamental education and training, is competent to design the system elements of the building under consideration by applying scientific methods in the solution of engineering problems associated with building hydrant system

Fire hydrant

An assembly usually contained in a pit or box below ground level and comprising a valve and outlet connection from a water supply main to permit controlled supply of water for firefighting. A pillar upstand connected to a water supply main and fitted with a valve and instantaneous coupling(s) adaptor will also constitute a fire hydrant

Fire region

A geographical area of New Zealand established as such under the Fire Service Act

Fire region commander

The officer of the New Zealand Fire Service appointed to be in charge of the Fire Region in which the building hydrant system is located, and includes any other officers specifically delegated by the Fire Region Commander to fulfil the functions of the Fire Region Commander under this Standard

F (firecell) rating	The rating intended to prevent firespread to another firecell, for sufficient time to provide for safe evacuation of occupants and protection of adjacent household units and sleeping areas in the building of fire origin and firefighters engaged in firefighting and rescue operations*
Fire resistance rating (FRR)	The term used to classify fire resistance of primary and secondary elements as determined in the standard test for fire resistance, or in accordance with a specific calculation method verified by experimental data from standard fire resistance tests. It comprises 3 numbers giving the time in minutes for which each of the criteria; stability, integrity, and insulation are satisfied, and is presented always in that order
Hydrant main, charged (charged riser)	A hydrant main installed in a building for firefighting purposes, fitted with inlet connections at fire brigade access level and building hydrant outlet assemblies at specified points. These are normally pressurised with water for monitoring purposes and provided with water by pumping fire service appliances for firefighting purposes NOTE – This is the type of hydrant main normally installed under this Standard.
Hydrant system certifier (HSC)	A person who has demonstrated competency to certify a hydrant system in accordance with this Standard NOTE – It is recommended that the HSC can be either an internationally recognised accreditation body to AS/NZS ISO/IEC 17020 to verify and certify building hydrant systems for compliance with NZS 4510 or the HSC may be a chartered professional engineer (CPEng).
Landing valve	An assembly comprising a single valve and building hydrant outlet connection from a wet or dry riser
Listed, listing	Where specific makes and models of equipment and materials are required or permitted by this Standard, means that they have been determined by a HSC to meet relevant Standards, and to be adequate for application where permitted or required by this Standard subject to any conditions or limitations specified in the listing
Low-rise building	A building with no more than one floor above and/or below the New Zealand Fire Service building address point NOTE – It is intended that this applies to buildings such as typical shopping malls or warehouses with large floor plans and external fire service access around the perimeter of the building.
National commander	The National Commander of the New Zealand Fire Service appointed under the Fire Service Act
Protected lobby	An enclosed part of a floor of plan area at least 6 m^2 with no dimension less than 2 m, directly accessible from a stairwell with all elements having a fire resistance rating derived from the F rating or the S rating of the adjacent firecell, whichever is greater, and with access doors self-closing and of the same fire resistance rating as the enclosure

Ratio valve	A form of pressure reducing valve in which the ratio between the building hydrant inlet and building hydrant outlet pressures is fixed irrespective of flow
Riser main, dry (dry riser)	A vertical pipe installed in a building for firefighting purposes, fitted with inlet connections at fire brigade access level and landing valves at specified points, which is normally dry but is capable of being charged with water usually by pumping from fire service appliances NOTE – Dry risers were installed to NZS 4510:1978 and are no longer permitted for new buildings. It is recommended that existing dry risers are converted to a charged riser, on a reasonably practicable basis.
Riser main, wet (wet riser)	A vertical pipe installed in a building for firefighting purposes and permanently charged with water from a pressurised supply sufficient for firefighting, and fitted with landing valves at specified points NOTE – Wet risers were installed to superseded editions of this Standard and are now not normally installed.
S (structural fire endurance) rating	The rating intended to prevent fire spread and structural collapse for the complete burnout of the firecell *
Safe path	That part of an exitway which is protected from the effects of fire by fire separations, external walls, or by distance when exposed to open air*

1.4 ABBREVIATIONS

1.4.1 The following abbreviations are used in this Standard:

BCA	Building consent authority
BHI	Building hydrant inlet
CPEng	Chartered professional engineer
DOL	Direct on line
FBA	Fire brigade alarm
FRR	Fire resistance rating
HSC	Hydrant system certifier
HSNO	Hazardous Substances and New Organisms Act
IQP	Independently qualified person
LBP	Licensed building practitioner
LED	Light-emitting diode
L/O	Lock open
N/C	Normally closed
NZFS	New Zealand Fire Service
NPSHR	Net positive suction head required

* These definitions are from the New Zealand Building Code and may be amended from time to time. Users should check http://www.dbh.govt.nz for the latest definitions and revisions.

NRV	Non-return valve
NZBC	New Zealand Building Code
OEM	Original equipment manufacturer
P_{NC}	Pressure declared by the National Commander
P_R	Additional pressure needed

1.5 INTERPRETATION

For the purposes of this Standard the word 'shall' refers to practices that are mandatory for compliance with this Standard, while the word 'should' refers to practices that are advised or recommended.

The terms 'normative' and 'informative' have been used in this Standard to define the application of the appendix to which they apply. A 'normative' appendix is an integral part of a Standard while an 'informative' appendix is only for information and guidance.

1.6 FORMAL INTERPRETATIONS

1.6.1 Requests for interpretations, rulings or clarifications received by Standards New Zealand directly shall be reviewed by a subcommittee of the Fire Hydrant Systems for Buildings Committee (P 4510), which prepared this Standard for the Standards Council established under the Standards Act.

C1.6.1 *The Fixed Fire Protection Formal Interpretation Committee which was constituted to deal with queries and interpretations of a number of fire protection Standards has jurisdiction to interpret the wording of the current published edition of the relevant Standard only. Matters not mentioned in the Standard are outside the scope of this committee and should be dealt with according to normal business practice.*

Requests for formal interpretations should be sent to the General Manager, Standards Development, Standards New Zealand, Private Bag 2439, Wellington 6140. An administration fee will be collected by Standards New Zealand for the processing of a request.

1.6.2 Formal interpretations shall be made when:

(a) An interpretation of a clause within this Standard is required;

(b) There is ambiguity in this Standard and clarification is required;

(c) Clarification of wording in this Standard is required because it does not achieve the intent agreed to by the committee;

(d) Building fire experiences of building hydrant system failures have been demonstrated and therefore the provisions of this Standard are inadequate, and a recommendation on amending the Standard is required and is submitted back to Standards New Zealand for consideration; or

(e) A recommendation is required because the wording within this Standard does not achieve the intent of the committee.

NOTES

2 GENERAL REQUIREMENTS

2.1 APPROVAL OF BUILDING HYDRANT SYSTEM

A building hydrant system shall be deemed to conform to this Standard when:

(a) The system has, in the case of a new system or extension to an existing system, been installed by a contractor and the contractor has submitted an application for its certification to the hydrant system certifier. In the case of an existing system whereby approval is sought in accordance with 2.7, application for approval has been submitted by a contractor to the hydrant system certifier.

(b) The technical requirements of the Standard are met;

(c) There exists to the satisfaction of the hydrant system certifier, a testing and maintenance contract with a contractor;

(d) The hydrant system certifier has certified the system and such certification remains in force.

2.2 VEHICULAR ACCESS

New Zealand Fire Service vehicular access shall comply with the requirements of the New Zealand Building Code for fire service vehicular access.

NOTE – A method of achieving this is currently provided in Acceptable Solution C/AS1 Part 8, of the Compliance Document for NZBC Clause C.

2.3 MATERIALS

2.3.1 General

2.3.1.1

Materials and components shall be appropriate for the ambient environmental conditions, the service conditions which apply, and the intended service life.

2.3.1.2

Pipework shall consist of the following materials manufactured to internationally recognised Standards set out in 2.3.2.2:

(a) Mild steel – either black or galvanised and manufactured to a pressure tubing Standard (see 2.3.2.2);

(b) Copper;

(c) Stainless steel;

(d) Plastic.

In buried applications, use of suitability rated plastic pipework, such as medium or high density polyethylene complying with AS/NZS 4130, shall be permitted. Attention is required to ensure that the manufacturer's recommendations for thrust blocks and the like are adhered to, and that backfill is free from sharp debris which could cause pipe failure through abrasion and the like.

Where steel pipe is used in buried applications, it shall be suitably protected from corrosion.

NOTE –

(1) Galvanising without additional protective coatings is not adequate protection against corrosion in buried applications.

(2) If petrolatum tape systems are used for protection of buried steel pipe, it is essential to use the complete system, including plastic overwrap tapes.

2.3.2 Pipework materials

The pipework materials shall conform to the following requirements concerning standard of manufacture, pressure rating, and method of jointing.

2.3.2.1

Hydrant systems used to supply hose reels (see 1.1.4), shall not be reticulated with black steel piping or fittings. In systems containing a booster pump, the pipework on the upstream side of the pump cooling water discharge shall not be of black steel.

2.3.2.2

Pipework materials shall conform to:

(a) Mild steel

Mild steel pipe shall comply with one of the following Standards:

AS 1074
AS 4041
ASTM A106/A106M – Grade B
NZS BS 1387
API Spec 5L – Grade B
Any other pipe identified as suitable by the HSC.

Piping shall meet the following requirements:

(i) Piping to AS 1074 or BS 1387 shall not exceed the working pressures set out in table 1. Acceptable methods of jointing are:

(A) Lightweight piping: welded flange; mechanical coupling

(B) Medium or heavyweight piping: screwed and socketed; welded flange; mechanical coupling.

Flanges and mechanical couplings shall have a test pressure rating of 1.5 times the maximum working pressure but not less than 1500 kPa

(ii) The working pressure rating of carbon steel piping manufactured to other AS, ASTM, or BS pressure tubing Standards shall be calculated using the following equation to provide a safety factor of 8:

$$P_w = \frac{f \times 2t}{8 \times D_o} \quad \text{(Eq. 1)}$$

where

P_w is the working pressure rating (kPa)
f is the stress (kPa) as specified in the manufacturing Standard
t is the tubing thickness (mm)
D_o is the outside diameter (mm).

Piping shall be jointed using welded flanges or mechanical couplings with a working pressure rating at least 1.5 times the maximum working pressure to which they will be subject, but not less than 1500 kPa.

NOTE – Carbon steel piping requires a higher safety factor than copper or stainless pipe due to external corrosion factors.

(iii) Black steel piping shall have at least one coat of priming paint.

(iv) Where galvanised piping is required, it shall be hot dipped or galvanised in the pipe mill as part of the pipe manufacturing process;

NOTE – Care is required when selecting mill galvanised pipe to ensure that the internal weld is adequately protected.

(b) Copper

(i) Copper piping shall be manufactured to conform to NZS 3501, AS 1432, AS 1572, or AS 4809 and shall be jointed using brazed fittings or mechanical couplings.

(ii) The minimum wall thickness of copper pipe shall be not less than the sizes stated in AS 1432.

(iii) The working pressure rating of the piping shall be calculated by dividing the theoretical bursting pressure by 6 but shall not be less than 1500 kPa.

(iv) Fittings shall have a working pressure rating at least 1.3 times the highest working pressure to which the fittings will be subject, but not less than 1500 kPa;

(c) Stainless steel

(i) Stainless steel piping shall be manufactured to an ASTM pressure tubing Standard, such as ASTM A312. A suitable grade of stainless steel shall be selected for the environment in order to avoid potential corrosion. Grade 316 shall be used in high corrosion areas or where threaded joints are used.

(ii) All sizes shall be jointed with welded flanges, threaded or mechanical couplings suitable for the working pressures involved.

(iii) Post weld pickling and passivation shall be undertaken in accordance with ASTM A380.

(iv) The working pressure rating of piping shall be calculated by dividing the theoretical bursting pressure by 4 but shall not be less than 1500 kPa. Flanges, couplings, and fittings shall have a working pressure rating at least 1.2 times the highest working pressure to which the components will be subject but not less than 1500 kPa.

Table 1 – Maximum working pressures of pipes to BS 1387 or AS 1074

Nominal Bore (mm)	Piping weight and jointing method				
	Welded flange or mechanical coupling			Screwed and socketed	
	Light (kPa)	Medium (kPa)	Heavy (kPa)	Medium (kPa)	Heavy (kPa)
15	–	8700	10700	4500	6200
20	–	7000	8500	3500	5100
25	–	6800	8500	3400	5100
32	–	5400	7600	2700	4000
40	–	4700	5900	2400	3500
50	3600	4300	5300	2400	3400
65	3200	3400	4200	1900	2700
80	2700	3200	3800	1900	2600
100	2400	2800	3300	1800	2300
150	–	2100	2300	1400	1700

NOTE – Pipework in the main waterway path shall be a minimum 100 mm nominal bore. Information for smaller pipes provided in this table is for the convenience of the user of the Standard for designing connections to hose reel systems, pump house trim, and associated pipework (see 6.1).

2.3.2.3
All welding on steel piping shall comply with the requirements of BS 2971 for Class 2 operating conditions. The provision in BS 2971 to allow alternative joint preparation is permitted by this Standard whether or not there is a specific agreement between the contracting parties, provided that for butt welded piping there is adequate weld penetration. For stainless steel pipe work welding shall comply with the requirements of BS 4677.

2.3.2.4
All welds shall be completed by welders holding current qualification in terms of NZS 4711 or AS/NZS 2980.

2.3.3 Piping supports

2.3.3.1
Piping supports shall be heat and corrosion resistant. Dissimilar metals shall be separated by an insulating material to prevent corrosion.

2.3.3.2
Piping supports and their fixings shall conform to NZS 1170.5 and 2.4 of this Standard.

2.3.3.3
Explosive driven fasteners shall not be used unless they are listed for use in fire protection services.

2.4 SEISMIC RESISTANCE

2.4.1 General

All components of the hydrant system shall be designed, detailed, and installed so they remain functional at the earthquake loadings specified in NZS 1170.5 taking into account the seismic design of the building elements which support, or are connected to the system.

NOTE –
(1) In new buildings the seismic design of the system should be developed in conjunction with that of the building.
(2) Design examples are set out in NZS 4219.

2.4.2 Equipment

Adequate horizontal restraint to meet NZS 4219 shall be provided for all heavy components such as pumps, tanks, valves, engines, and batteries to ensure that connections to the plant are secure in a seismic event.

2.4.3 Pipework

The system pipework shall be supported to resist seismic loads by either:

(a) A complete piping support system based on a dynamic seismic analysis so that the pipework system performance shall be at least equal to that of the building structure under the earthquake loadings of NZS 1170.5; or
(b) A piping support system which shall comply with the requirements of 2.4.4 to 2.4.9 inclusive.

NOTE – The design of the support system to resist seismic loads on pipework is based on the following principles:
(1) Lateral supports are of sufficient stiffness to force piping to move with the immediate support structure;
(2) Lateral supports are spaced to limit piping deflections under resonating dynamic load so that piping joints and intermediate vertical supports are not over-stressed;
(3) Lateral supports are ductile and fixings designed over-strength;
(4) Stresses due to differential movements of building structures are minimised through the use of piping flexibility or clearances.

2.4.4 Pipework support

2.4.4.1

When it is reasonably practicable, vertical sections of the main waterway shall be located in a vertical safe path or protected shaft.

NOTE – Refer to the NZBC Compliance Documents for definitions of vertical safe path and protected shaft.

2.4.4.2

Pipe fixings and supports shall be heat and corrosion resistant.

2.4.4.3

All supports shall be designed to resist repeated forces due to seismic acceleration of 1.0 g acting on the mass of the pipework in any direction in addition to the gravity force.

NOTE – This load may be greater than the requirements of NZS 1170.5, and may increase the support size but it eliminates the need for a more detailed study.

2.4.4.4

All fixings in materials which fail in a brittle manner, such as concrete or timber, shall have a safety factor of not less than 2.

NOTE – The pipework lateral supports are detailed for limited ductility and over-strength is required in fixings to prevent brittle failure at loadings greater than the design earthquake.

2.4.5 Flexibility

2.4.5.1

Pipework shall have sufficient flexibility to prevent over-stressing of pipes, hangers, and braces in an earthquake. Flexibility shall be provided in the X, Y, and Z axes at structural separations.

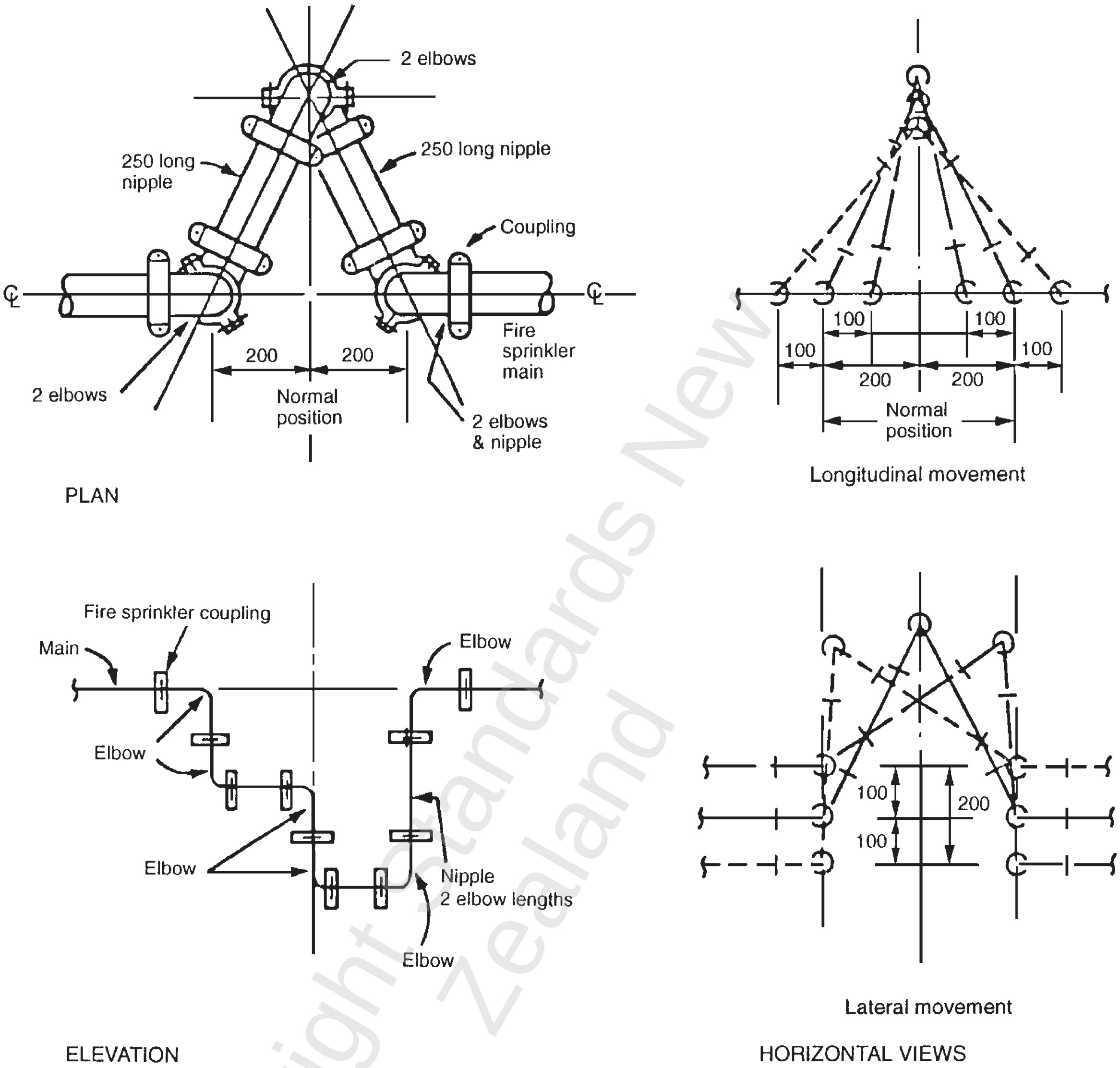
NOTE – A swing joint able to take movements of ±100 mm is shown in figure 1.

2.4.5.2

Sufficient flexibility shall be provided in the main waterway to allow for ±80 mm horizontal movement per 4 m of height of the building. Where piping crosses structural separation an allowance for relative horizontal movement is required of either ±160 mm per 4 m of height of the structural separation, or the building design movement where known. Where the main waterway passes through more than one floor and is more than 1 m from a column, or structural shear wall either the form of the fixing, or the pipework flexibility, shall allow for differential movement between floors.

2.4.5.3

Flexibility shall be achieved through piping flexibility or by the use of flexible couplings of the mechanically housed type providing axial and lateral pipe connection which is equivalent to the piping strength.



All dimensions are in mm.

Figure 1 – Seismic flexible joint

2.4.5.4

Thin-walled metal expansion bellows type couplings may be used only where:

(a) The ends of the piping being connected are fixed to the structure; and

(b) The rating of the bellows allows for 150% of the anticipated differential movement in all directions.

2.4.5.5

Rubber couplings are not acceptable.

2.4.5.6

Flexible couplings shall be provided within 600 mm to 900 mm of non-structural concrete or masonry walls to which pipework is rigidly fixed, or alternatively ensure adequate piping flexibility. This requirement shall also apply to sections of pipework attached to different parts of a building that may respond differently in an earthquake, such as between a wall and a roof, or between basement walls and the ground.

2.4.6 Bracing – general requirements

2.4.6.1

The requirements of this section apply to steel pipework only. Bracing shall be provided to restrain pipework under seismic load. Hangers not longer than 150 mm can be used for lateral bracing and, if clamped tightly to the pipe for longitudinal bracing, provided that in both cases the hangers will not break or detach under the seismic load.

2.4.6.2

Bracing shall be positioned and aligned in conjunction with flexible couplings so that no bracing is subject to seismic load from pipework outside its immediate vicinity. Typical locations of pipework bracing within a building are shown in figure 2.

NOTE – Piping hangers that do not provide lateral restraint are not braces.

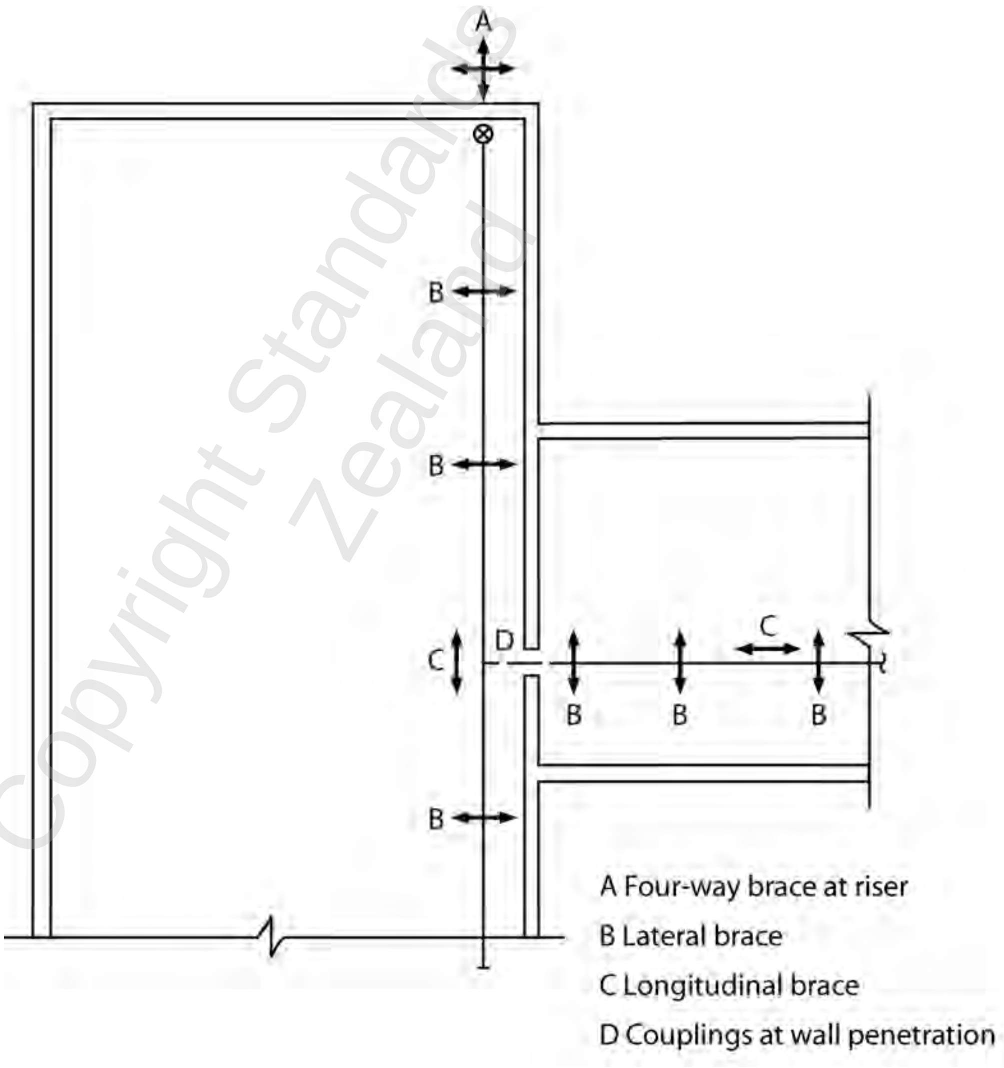


Figure 2 – Location of pipework bracing

2.4.7 Bracing – Specific requirements

2.4.7.1

Piping in the main waterway, including that supplying a particular building hydrant outlet zone, shall be provided with bracing:

(a) Laterally at less than 1.2 m from unrestrained ends;
(b) Laterally at a maximum spacing of 12 m;
(c) Laterally within 600 mm of a flexible coupling (on at least one side);
(d) Laterally within 600 mm of both sides of a swing joint crossing a structural separation.

At least one longitudinal brace shall be included.

2.4.7.2

A branch pipe connected to the main waterway can provide the required longitudinal restraint provided the branch pipe is of equal or larger size and is laterally restrained within 600 mm of the branch connection.

2.4.7.3

Tension/compression braces shall be at an angle to the vertical of not less than 30°. Acceptable types of bracing are shown in figure 3. The following shall also apply:

(a) The slenderness ratio L/r of compression braces shall not exceed 200

where

L is the length of brace
r is the radius of gyration of brace.

(b) The maximum horizontal loads that can be resisted by compression braces at various brace angles are shown in table 2.

NOTE – For a seismic acceleration of 1.0 g the required restraining force F_P is given by:

$$F_p = W_p \times 0.00981 \times L_p \text{ (kN)}$$

where

L_p is the length of piping under restraint in m.
W_p is the weight of water-filled pipe in kg/m.

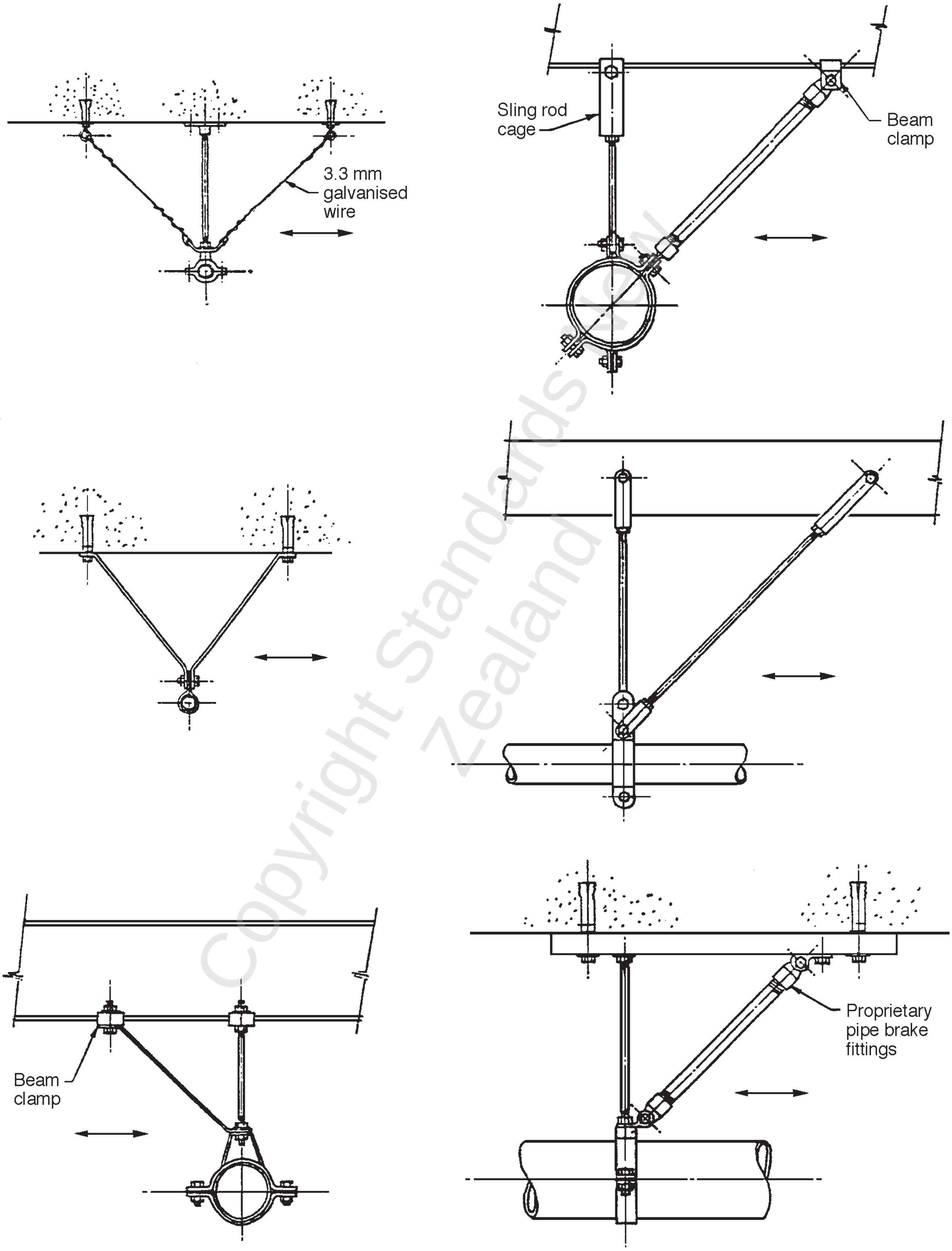


Figure 3 – Bracing details

Table 2 – Allowable horizontal loads of typical pipework braces

Shape and size (mm)	Brace length for *L/r* = 200 (m)	Allowable horizontal support load 30° angle from vertical (kN)	45° angle from vertical (kN)	60° angle from vertical (kN)	Horizontal (kN)
Galvanised steel wire 3.2 dia.	(tension only)	0.23	0.33	0.40	0.45
Mild steel rod					
10 dia.	0.50	1.0	1.4	1.7	1.9
12 dia.	0.60	1.4	2.0	2.4	2.8
16 dia.	0.80	2.5	3.5	4.3	5.0
20 dia.	1.00	3.9	5.5	6.8	7.8
BS 1387 medium tube					
20 NB	1.7	2.5	3.5	4.3	5.0
25 NB	2.2	3.9	5.5	6.8	7.8
32 NB	2.8	5.0	7.1	8.7	10.1
40 NB	3.2	5.7	8.1	9.9	11.5
50 NB	4.0	8.1	11.5	14.0	16.2
65 NB	5.1	10.4	14.7	18.1	20.8
Mild steel flat					
40 x 6	0.35	3.0	4.2	5.2	6.0
50 x 8	0.46	5.0	7.0	8.6	10.0
50 x 10	0.58	6.2	8.8	10.8	12.5
Mild steel angle					
25 x 25 x 3	0.96	1.7	2.5	3.0	3.5
30 x 30 x 5	1.1	3.4	4.9	6.0	6.9
40 x 40 x 5	1.5	4.7	6.7	8.2	9.4
50 x 50 x 5	1.9	6.0	8.4	10.3	12.0
60 x 60 x 6	2.3	8.6	12.2	14.9	17.2
80 x 80 x 6	3.1	11.6	16.5	20.2	23.3

2.4.7.4

Bracing shall be tight and concentric. All parts and fittings of a brace should be in a straight line to avoid eccentric loading on fittings and fastenings. The connection of brace to piping shall be snug and tight and shall be able to transfer load from the pipe to the brace and remain tight under vibration. Lateral bracing shall be perpendicular to the piping.

2.4.7.5

Bracing fixings to the piping and to the immediate support structure shall be designed to resist the earthquake loading specified in 2.4.4.1. The horizontal loads that can be resisted by typical fixings for various bracing configurations for horizontal piping are shown in table 3 subject to the following:

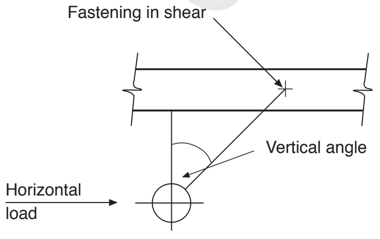
(a) Masonry anchors shall be installed to the manufacturer's specifications;
(b) Bolts to steel members shall comply with the requirements (for example, edge distances) of NZS 3404;
(c) Bolted and screwed connections to timber shall comply with the requirements of NZS 3603.

Table 3 – Horizontal load capacity of typical connections

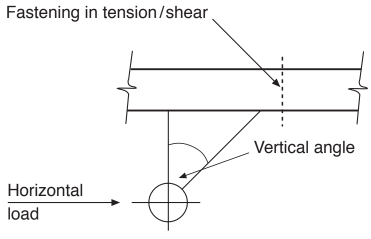
Fastening type	Horizontal load capacity					
	Vertical angle 30°		Vertical angle 45°		Vertical angle 60°	
	Type A (kN)	Type B (kN)	Type A (kN)	Type B (kN)	Type A (kN)	Type B (kN)
Masonry anchors						
M6	1.7	1.3	2.4	2.0	2.9	2.6
M8	3.0	2.0	4.2	2.9	5.2	3.8
M10	4.4	2.9	6.2	4.3	7.6	5.5
M12	6.8	4.3	9.5	6.3	11.7	8.7
M16	12.0	5.7	17.0	8.7	20.9	12.3
Bolts to steel						
M6	1.7	1.9	2.4	2.6	2.9	3.0
M8	3.0	3.5	4.2	4.6	5.2	5.4
M10	4.7	5.5	6.7	7.3	8.1	8.5
M12	6.8	7.9	9.5	10.5	11.7	12.3
M16	12.0	14.4	17.0	19.1	20.9	22.0
Bolts to BP 450 purlins						
M6	1.7	–	2.4	–	2.9	–
M8	2.9	–	4.1	–	5.0	–
M10	3.6	–	5.1	–	6.2	–
M12	4.3	–	6.1	–	7.4	–
M16	5.7	–	8.1	–	9.9	–
Bolts to timber						
M12	2.1	–	3.3	–	4.4	–
M16	2.9	–	4.8	–	7.1	–
M20	3.7	–	6.4	–	10.0	–
Coach screws to timber						
M8	–	0.75	–	0.95	–	1.1
M10	–	1.3	–	1.8	–	2.2
M12	–	1.8	–	2.6	–	3.4
M16	–	3.0	–	4.2	–	5.6
M20	–	4.3	–	6.2	–	8.4

NOTE –

(1)



TYPE A



TYPE B

(2) Bolted shear (type A) connections to timber assume a nominal timber thickness of 50 mm.

(3) Tension/shear (type B) connections to timber assume coach screws penetrate timber 10 times the shank diameter and have a minimum thread length 6 times the shank diameter.

(4) The loads for timber connections are for dry timber. For green timber reduce the loads by 30%.

2.4.7.6

Bracing for piping of diameter 80 mm or larger shall not be restrained by timber members which are less than 100 mm in the direction(s) of the plane(s) of bending. The distance of the point of fastening from any edge of the timber shall be not less than 30 mm or 4 fastener diameters whichever is the greater. In addition the following apply:

(a) Braces shall not be welded to cold rolled sections 3 mm or less in thickness;
(b) Explosive driven fasteners shall comply with 2.3.3.3;
(c) Expansion fasteners in concrete which are secured by driving the fastener against a wedge at the bottom of the hole shall not be used.

NOTE – This type of expansion fastener has performed poorly in earthquakes.

2.4.7.7

The building element to which the brace is fixed shall be capable of withstanding the force which the brace imposes on it.

2.4.8 Clearance

2.4.8.1

Clearance on all sides from the building elements, shall be provided as set out in table 4, around all piping extending through non-structural walls, floors, platforms, and foundations.

Table 4 – Minimum pipe clearance

Pipe diameter	Clearance
Up to 40 mm nominal diameter	25 mm
All other piping	50 mm

The gap may be sealed provided that a flexible or frangible material is used.

2.4.8.2

No clearance is required for piping passing through partitions or walls of frangible materials (such as gypsum board) unless the wall is required to have a fire resistance rating.

2.4.8.3

No clearance is required if the piping is attached rigidly to the wall and there is adequate piping flexibility on both sides of the wall to prevent damage from movement of the pipework under seismic loads.

2.4.8.4

In walls required to be fire resistance rated the gap shall be filled with a flexible material which will preserve the fire resistance rating of the wall.

2.4.9 Hangers

Hangers shall be connected to the piping and to the immediate support structure by fixings that cannot detach in an earthquake.

2.5 FROST PROTECTION

In areas where system pipework is subject to freezing, consideration shall be given to antifreeze. This shall be peer reviewed by the HSC.

NOTE –

(1) Examples could include weak solutions of antifreeze, insulation, artificial heating, or trace heating.

(2) Draining the system during winter is not acceptable.

2.6 LABELLING AND SIGNS

2.6.1 All markings, signs, and labels required by this Standard shall incorporate indelible markings and unless otherwise specified, or approved as a feature of listed equipment, or required by law shall comply with NZS 5807 and be safety red and white with red as the predominant colour.

NOTE – Attention is drawn to requirements of the Building Regulations for certain signs which are subject to a building consent.

2.6.2 Labelling on the building hydrant inlet and on building hydrant outlets (where enclosed) shall incorporate letters at least 50 mm high.

2.6.3 Pipework associated with the hydrant system shall be identified.

NOTE – NZS 5807 is an acceptable method of identification.

2.6.4 The function of pressure gauges and valves shall be clearly labelled along with the correct normal position of valves.

2.6.5 The building hydrant pump shall be identified by a location plate fixed on the outside of an external wall adjacent to the New Zealand Fire Service entry, and if necessary a further plate on any opaque door within the building which has to be opened in order to gain access to the building hydrant pump. Such plates shall bear the words in reflective lettering at least 25 mm high:

TO FIRE PUMPS
NZ FIRE SERVICE

NOTE – See B1, B2, and B3 of Appendix B for further information.

2.6.6 In stairwells which do not contain building hydrant outlets, signs (as required by 3.2.2) shall be at least 600 mm x 300 mm, with the words 'NO FIRE HYDRANTS IN THIS STAIRWELL' in at least 25 mm high reflective lettering. This sign shall be mounted on any door where the fire service is likely to gain entrance to the stairwell.

2.7 PRELIMINARY APPROVAL OF BASIC DESIGN DECISIONS

2.7.1 Prior to commencement of installation, approval shall be sought from the hydrant system certifier for the following features of a building hydrant system intended to comply with this Standard. The features are:

(a) Location of building hydrant outlets;
(b) Location of building hydrant inlet;
(c) Location of piping forming the main waterway;
(d) Location of pump units (where required);
(e) System design flow;
(f) Pressure required at the downstream connection of the inlet;
(g) Type of pump unit driver;
(h) Intended characteristics flow/pressure curve for each pump.

2.7.2 An application for such approval shall be in the form required by the hydrant system certifier and shall include:

(a) Typical cross sections and floor plans;
(b) Height of the highest building hydrant outlet above the building hydrant inlet;
(c) A schematic drawing of the hydrant system.

2.8 ELECTRICAL BONDING

All sections of the hydrant system shall be electrically bonded to the main building earth. The hydrant system shall not be used as an earth continuity conductor.

NOTES

3 DESIGN CRITERIA

This section of the Standard is for buildings which are not defined as low-rise. For guidance on hydrant coverage in low-rise buildings, see Appendix C.

3.1 PRESSURE REQUIRED AT OUTLET

The pressure available at each building hydrant outlet when the design number of hose streams are in simultaneous operation at the design flow, shall be not less than 600 kPa or more than that permitted by 6.2.1.

3.2 NUMBER AND SPACING OF OUTLETS PER FLOOR

3.2.1 Other than on the ground floor, there shall be at least one building hydrant outlet assembly per floor. This building hydrant outlet assembly shall be located in the vertical safe path or a protected lobby at each floor or mid-floor landing. Additional building hydrant outlet assemblies shall be installed in the following locations:

(a) On any floor where in a sprinkler protected building every point on the floor is not covered by an arc of 40 m measured from the point of entry from the safe path onto the floor;

(b) On any floor where in a non-sprinkler protected building every point on the floor is not covered by an arc of 32 m measured from the point of entry from the safe path onto the floor. The arc length from any additional hydrant outlet assemblies shall be 40 m;

(c) On the roof where there is door access to the roof. This building hydrant outlet assembly shall fully comply with 4.2;

(d) On intermediate floors and mezzanines directly accessed to or from the stair tower, where full coverage is not achieved from (a) or (b). Amd No. 1 Jan. '09

NOTE –

(1) It is not necessary to provide a building hydrant outlet on the ground floor of a building where the fire service is expected to use externally fed hoses for its operations. However, it should be noted that Acceptable Solution C/AS1, of the Compliance Document for NZBC Clause C requires that where the length of hose required to access all areas of the ground floor exceeds 75 m, that internal hydrants be provided for use by the fire service, and that this requirement may override this clause.

(2) Where the building has multiple floors served from street level, the ground floor is the one adjacent to the main fire service attendance point.

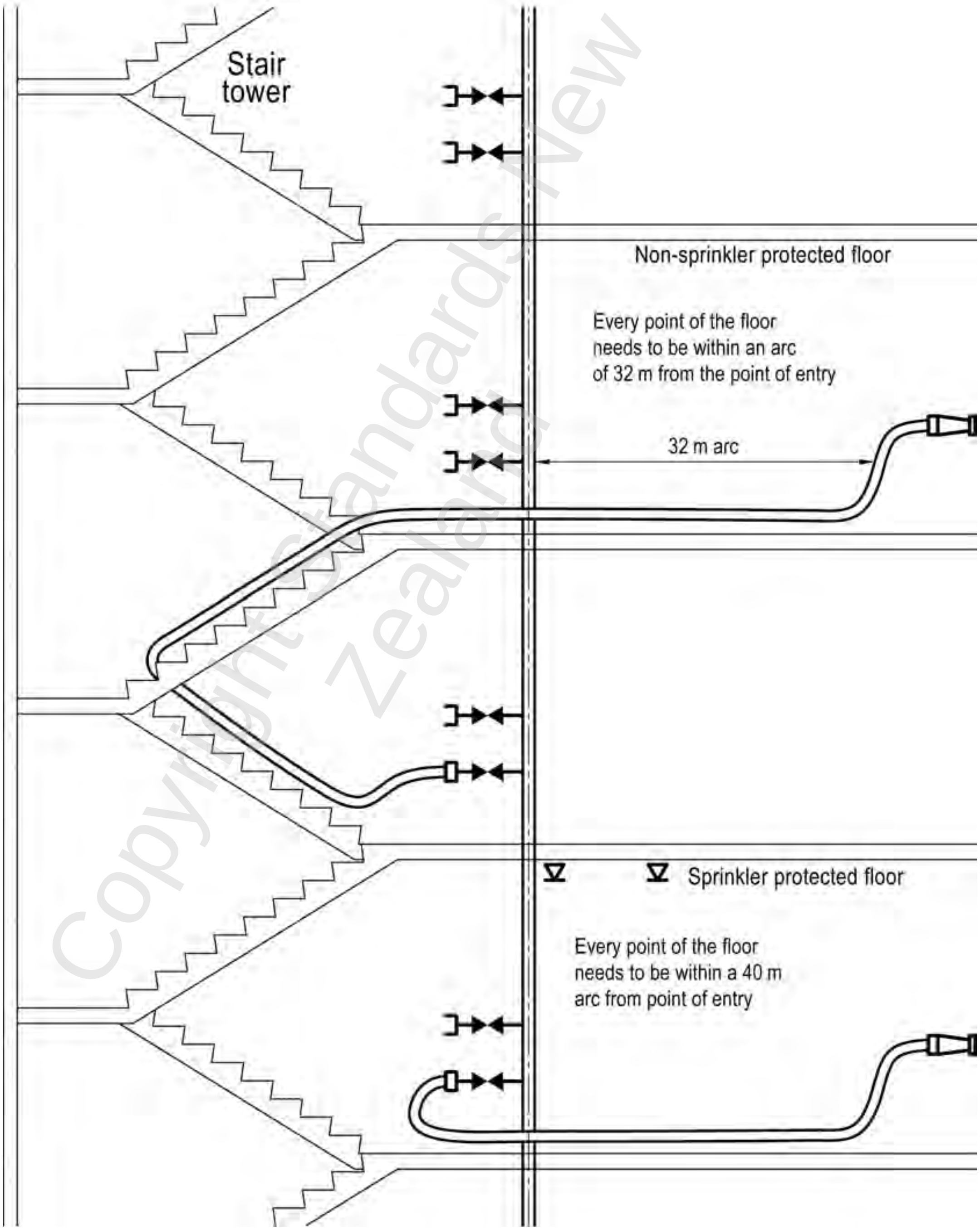
3.2.2 It shall not be required to have building hydrant outlets in every stair (or in a protected lobby directly accessible from the stair) provided that there is a warning sign, as specified in 2.6, to that effect at each level with external access (or in the landing at that level) of each stair which does not have building hydrant outlets.

3.2.3 Where hydrants are located in a scissors stair serving a common protected lobby or floor area, building hydrant outlets shall be located at each floor level accessible from the stair designated for fire service use.

NOTE – The provisions requiring building hydrant outlets in both stairwells of a scissor stair have been deleted from this edition of the Standard.

3.2.4 Where building hydrant outlets have been provided in every stair in a building on an optional basis, it is not necessary for the purposes of table 5, to assume all building hydrant outlets are operating.

NOTE – See section 4 on the location of individual building hydrant outlets.



NOTE – See 1.4.1 and Appendix E for meaning of abbreviations and graphical symbols.

Figure 4 – Measurement of hose lengths

3.3 REQUIRED FLOW RATES

3.3.1 Buildings fitted with an approved fire sprinkler system

For buildings fitted with an approved sprinkler system, the design number of hose streams in simultaneous use shall be three flowing at 500 litres per minute each (total design flow shall be 1500 litres/minute).The design number of flowing streams per floor shall be two on the hydraulically most remote floor, and the third stream on the floor immediately adjacent.

3.3.2 Buildings not fitted with an approved fire sprinkler system

For buildings not fitted with an approved sprinkler system, the design number of hose streams in simultaneous use shall be determined from table 5.

The minimum flow rate per hose stream shall be 440 L/min. Amd No. 1 Jan. '09

Table 5 – Determination of design number of simultaneous hose streams in unsprinklered buildings

Greatest number of building hydrant outlets required on any floor (see 3.2)	**Design number of flowing streams per floor**	**Number of simultaneous floors** (see Note 1)	**Design number of simultaneous hose streams**
1	2	2	4
2	4	2	8
3	5	2	10
4 or more	6	2	12

NOTE –
(1) In single-storeyed buildings, this value reduces to 1.
(2) See 6.4.6 for design flow.
(3) See Appendix C for low-rise buildings.

3.4 REQUIREMENT FOR BOOSTER PUMPS

3.4.1 If, in order to meet the pressure required at every building hydrant outlet (as specified in 3.1) the pressure required at the downstream side of the building hydrant inlet (P_R) is greater than (P_A) as derived by the formula in equation 2, then one or more booster pumps shall be provided in accordance with 3.4.2.

$$P_A = P_{NC} - \Delta P_I \quad \text{(Eq. 2)}$$

where

P_A is the pressure available

P_{NC} is the pressure declared by the National Commander (see Appendix D).

ΔP_I is the loss or gain of pressure due to friction and elevation in the hoselines between the fire service pumping appliance and the building hydrant inlet, and in the building hydrant inlet assembly calculated in accordance with 6.4.

3.4.2 In buildings not fitted with approved sprinkler systems, if the required boost is less than 150 kPa, one booster pump shall be required, otherwise 100% redundancy in pumping shall be required. In buildings fitted with an approved sprinkler system, one booster pump is required.

3.5 PIPEWORK TO BE CHARGED WITH WATER

3.5.1 Every section of the hydrant system pipework shall be kept charged with water at a positive pressure of at least 15 kPa by means of a permanently connected pressurised water supply.

NOTE – If a pressurising pump is used to pressurise the system, a larger pressure differential may be required in order to detect pressure drop to start this pump.

3.5.2 The pressurised supply shall be through a pipe of not less than 15 mm diameter and be capable of maintaining a flow of 25 L/min. It shall be controlled only by a locked open, indicating valve labelled 'Fire Service Hydrant System: Normally Open'. A backflow prevention device or check valve (if not connected to a potable supply) shall be provided in this connection. The backflow prevention unit shall be provided in a position conducive to inspection and maintenance.

3.5.3 On systems including a booster pump or pumps, the point of connection shall be in accordance with figure 13 or figure 14 and the flow rate shall also be sufficient to provide the total water required for pump and driver cooling when all pumps are operating at maximum load under test conditions. (See 7.5.2.)

3.5.4 Where the hydrant system forms part of the reticulation for hose reels in the building, the required flow rate in 3.5.3 shall be increased by a flow equivalent to the simultaneous operation of the two hydraulically most favourably placed hose reels. The required pressure shall be sufficient to ensure compliance with AS/NZS 1221, according to the Standard of manufacture, when any two reels are operating.

NOTE – Attention is drawn to the pressure limits of various hose reel assemblies.

3.6 OPTIONAL PROVISION OF PRESSURISED WATER SOURCE

3.6.1 An owner may elect to provide a permanently piped connection from a reliable pressurised water source to the hydrant system to permit firefighting hose streams to be established prior to fire service arrival. This shall only be permitted if, having regard to the flow and pressure characteristics of the water source, there will be available at any building hydrant outlet, a pressure of at least 600 kPa when the system is delivering a flow of 1500 L/min and this will be sustained for at least 30 min.

3.6.2 Should it be necessary to use a booster pump to meet this requirement, either an electric motor or diesel-driven pump, conforming to section 7 and, additionally, arranged to start automatically on detection of pressure drop shall be provided for this purpose. The pump may also function as a booster pump for the primary function of the hydrant system.

The automatic starting arrangements and components shall be of a type which is listed for NZS 4541.

3.6.3 The building hydrant inlet enclosure shall be labelled in accordance with 5.2.4.

NOTE – Incorporation of a pressurised water source is not recommended unless, associated with the hydrant system outlets, there are cabinets containing adequate hose and branches, so that such equipment is routinely maintained in good condition, and staff are trained in the safe and correct use of the equipment. The New Zealand Fire Service should be consulted on these matters.

4 BUILDING HYDRANT OUTLETS

4.1 LOCATION

4.1.1 Building hydrant outlets shall be so located to allow ready and efficient use by the fire service. Clearances shall conform to 4.2.3.

NOTE – Refer to any Standard Operating Procedure declared by the National Commander (see Appendix D).

4.1.2 Building hydrant outlets in vertical safe paths shall be situated on floor or mid-floor landings. Amd No. 1 Jan. '09

4.1.3 Locks on enclosures, where fitted, shall comply with figure 7. The door of any such enclosure shall be frangible.

NOTE –
(1) Enclosures are permitted but not required by this Standard.
(2) Other types of lock to that shown in figure 7 may be declared acceptable by the National Commander.

4.1.4 Building hydrant outlet enclosures may incorporate a hose reel or other fire equipment but in all cases, the clearances specified in 4.2.3 shall be maintained and the door shall not be locked. Hose reels shall not be mounted on the enclosure door.

4.1.5 Enclosures shall be clearly marked with the words 'BUILDING HYDRANT OUTLET' in 50 mm high contrasting lettering.

4.1.6 Where required by the building owner, valves may be locked using the type of lock shown in figure 7. Alternatively they may be secured using keyed alike standard padlocks acceptable to the National Commander.

4.2 OUTLET ASSEMBLY

4.2.1 Each building hydrant outlet shall incorporate two 70 mm double-lugged instantaneous female hose couplings conforming to SNZ PAS 4505. Each coupling shall be controlled by a lever operated ball valve, or by a pressure reducing valve incorporating a handwheel shut-off (one per coupling), and a tool-adjusted pressure reducing setting which shall be sealed at the set pressure.

Where there are multiple fire hydrant inlet assemblies within a single building complex, they shall be interlinked so that any inlet may be used to serve any building hydrant outlet.

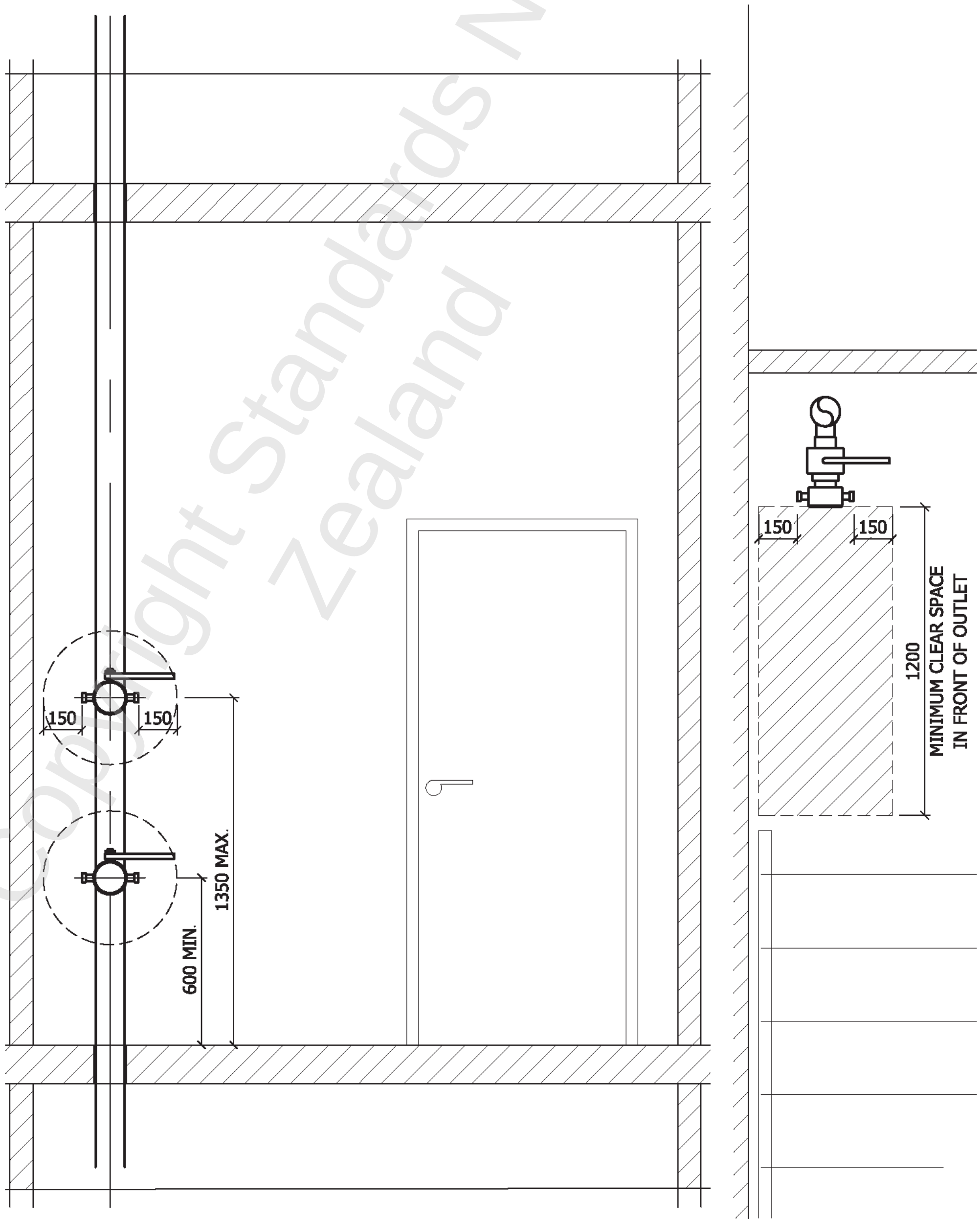
NOTE –
(1) An example of a location where lever operated ball valves may not be fit for purpose is an area where environmental conditions could cause corrosion which could seize the operating lever.
(2) Lever operated ball valves are not suitable for throttling purposes. The standard building hydrant outlet specified in this Standard is based on the fire service fully opening the building hydrant outlet and controlling flow at hose nozzles. Where building hydrant outlets may be used by the building's occupants for non-firefighting purposes, and flow is required to be controlled at the building hydrant outlet, the use of alternative valves such as landing valves described in SNZ PAS 4505 may be required.

4.2.2 The axis of each coupling shall be 45° down from the horizontal with lugs positioned horizontally.

NOTE – Couplings need not be side by side.

4.2.3 There shall be a 150 mm clear space around the outer edge of the lugs and the operating arc of the lever of the ball valves (and, on existing systems, the handwheel). See figure 5.

4.2.4 Unobstructed access shall be provided to a clear space of 1200 mm in front of the couplings. Couplings shall not be closer than 600 mm to the floor or further than 1350 mm. See figure 5.



All dimensions are in mm.

Figure 5 – Outlet assembly spatial requirements

5 BUILDING HYDRANT INLET

5.1 LOCATION

The building hydrant inlet shall be on the outside of the protected premises in a location approved by the New Zealand Fire Service. The building hydrant inlet assembly shall be within 18 m, and in clear view of, a point on a roadway or area of hardstanding which is readily accessible by a fire appliance. Access to the inlet shall be unobstructed. The building hydrant inlet may be located away from the building provided that all criteria of the Standard are met.

NOTE – The New Zealand Fire Service publishes *A guide to fire service operations for buildings* which provides useful background advice on fire service requirements for the use of riser systems.

5.2 ENCLOSURE

5.2.1 Construction

5.2.1.1

The building hydrant inlet shall be housed in enclosures constructed to ensure that delivery hoses can be connected to the couplings without kinking. The enclosure shall be of such dimensions to allow a solid cone having an included angle of 45° to be placed in each connection coaxially with the connection, without the cone touching any part of the enclosure or open door. No part of the enclosure or the door when open shall be a lesser distance than 125 mm from the axis of any connection projected. Couplings shall be located no more than 150 mm from the internal face of the enclosure door.

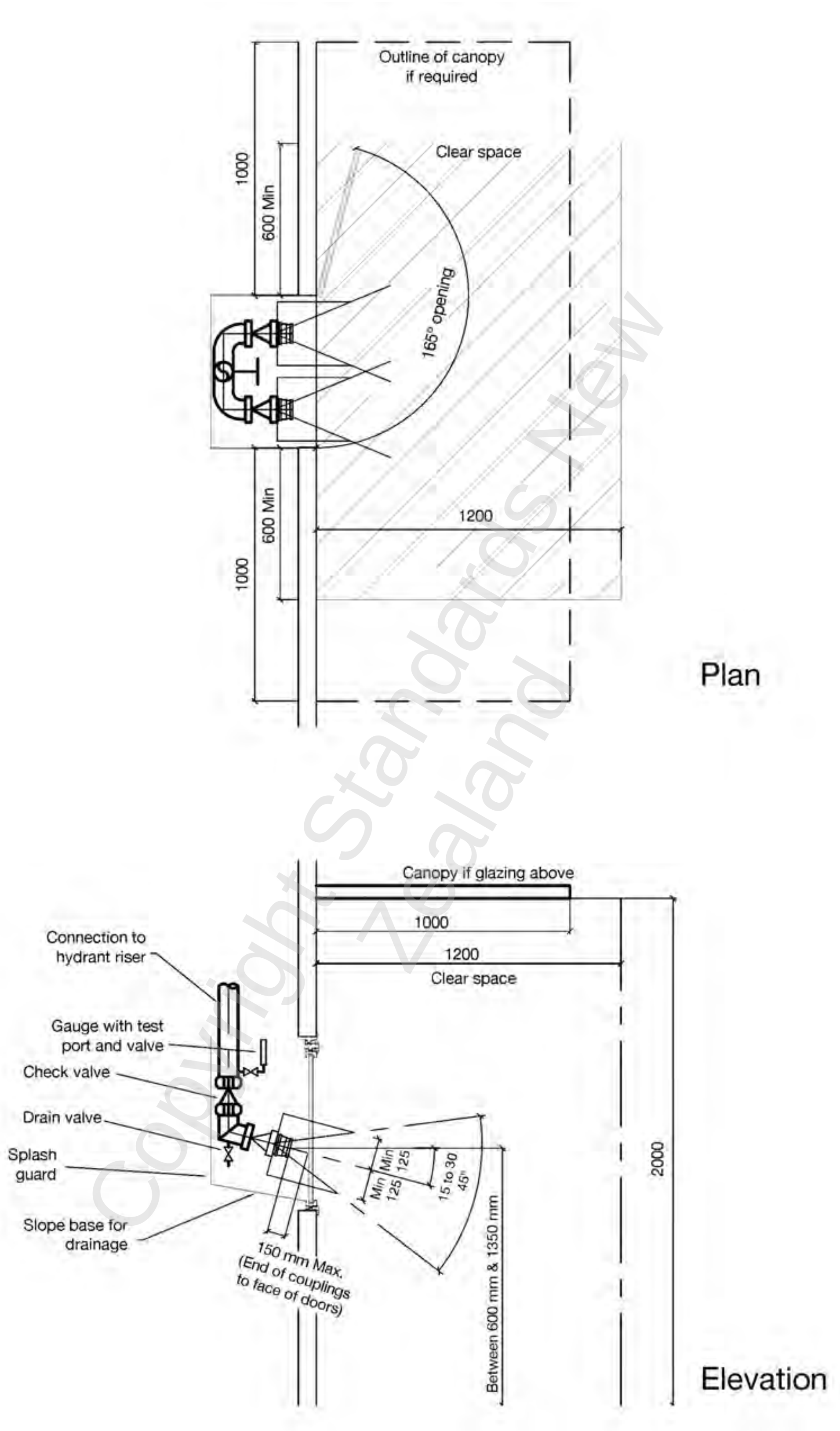
5.2.1.2

The axis of the couplings shall be between 15° and 30° down from the horizontal. See figure 6.

5.2.1.3

A clearance of at least 75 mm shall be provided between the rim of any hand-wheel and any part of the enclosure or equipment.

Within the enclosure, there shall be a document holder, fixed to the enclosure and of dimensions to permit the insertion of an A4 size folder 15 mm thick.



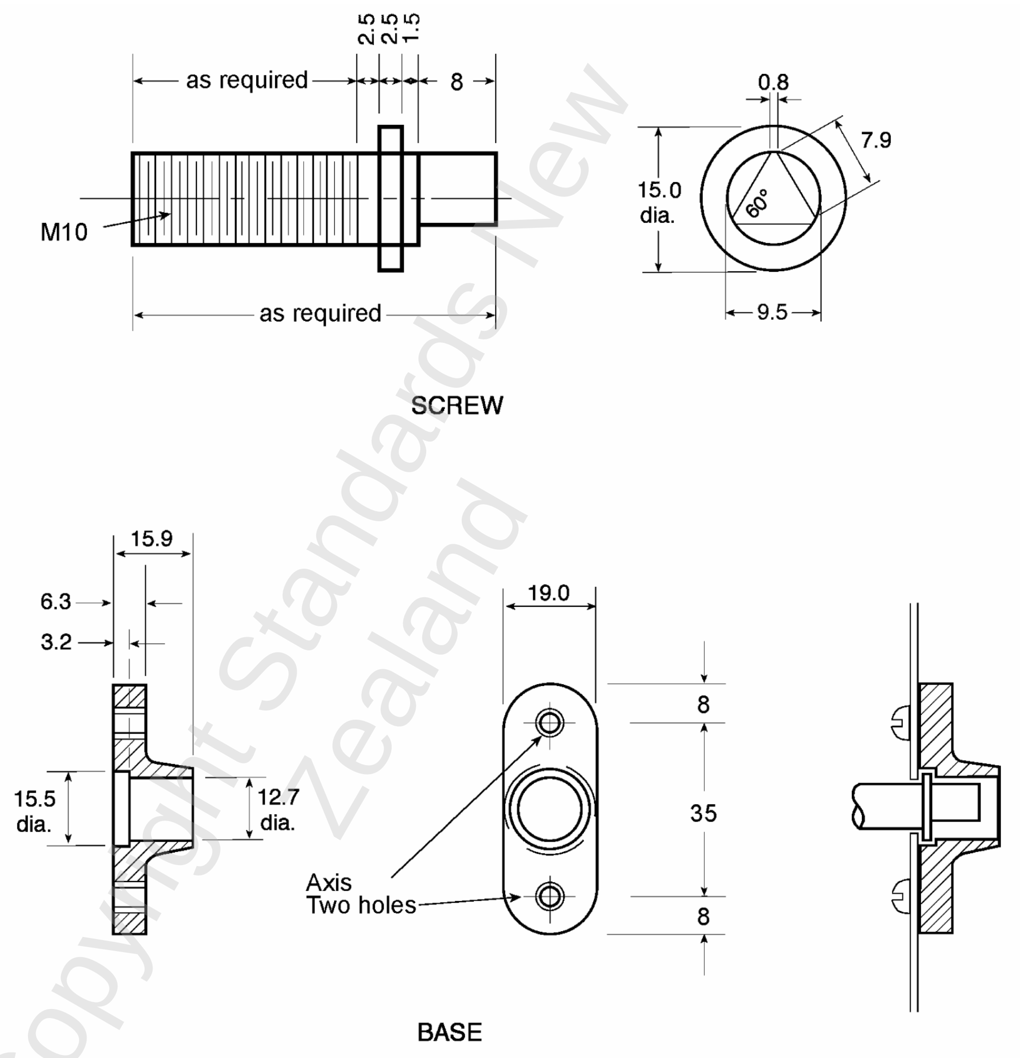
All dimensions are in mm.

Figure 6 – BHI standard requirements

5.2.2 Door

5.2.2.1

Doors may be side-hung or bottom-hung, and shall in either case open through not less than 165°. The door shall be locked by a triangular key locking device, as shown in figure 7, requiring no more than 5 revolutions to open the lock.



All dimensions in mm.

Figure 7 – Details of box lock

Alternatively, other types of approved locking devices may be used subject to approval by the New Zealand Fire Service's National Commander.

5.2.2.2

The door shall have a break-out panel large enough to enable delivery hoses to be connected without kinking, if the door cannot be opened and emergency access has to be made by breaking out the panel.

5.2.2.3
The break-out panel shall be designed so that on removal no sharp edges shall remain.

5.2.2.4
The outside of the enclosure door shall bear the words 'BUILDING HYDRANT INLET' in contrasting letters at least 50 mm high.

5.2.3 Splash guards

A splash guard shall be provided to the sides, rear, and bottom of the enclosure to ensure that the risk of water damage to the interior of the building is minimised. The splash guard shall be provided with suitable drainage.

5.2.4 Usage

The enclosure may also be used to house the flow gauge attachment point for flow testing the hydrant system and the fire sprinkler inlet for any fire sprinkler system serving the building. In such cases, the building hydrant system, flow gauge attachment point and the fire sprinkler inlet shall be separate assemblies, each bearing the words 'FIRE SPRINKLER INLET', 'HYDRANT TEST OUTLET' and 'BUILDING HYDRANT INLET' respectively, in contrasting letters at least 50 mm high.

Other than any indication and control panels for the control of building hydrant systems as per 5.4.1, the enclosure shall not be used to house any other equipment.

5.2.5 Clear working space

A space measuring 600 mm either side of the inlet enclosure, 1200 mm out from the face of the enclosure and extending up 2000 mm from the surrounding standing surface shall be clear of all objects.

5.2.6 Falling glass

Where the door of the enclosure is on a glazed exterior wall of a multi-storey building, either a veranda or other assembly shall be provided extending at least 1 m in front and 1 m either side of the enclosure to provide protection from falling glass.

5.3 INLETS

See figure 6.

5.3.1 Specification

Each inlet shall consist of a 70 mm male instantaneous hose connection and shall comply with SNZ PAS 4505. Each individual male connection shall be fitted with a clapper valve of the swing-hinged type.

5.3.2 Number of inlets

The required number of inlets shall be not less than half the design number of simultaneous hose streams specified in 3.3.2 but in no case not less than two inlets.

5.3.3 Height of couplings

The fire sprinkler inlet shall be positioned so that the axis of the highest and lowest coupling is not closer to the surrounding standing surface than 600 mm or further than 1350 mm.

5.4 OTHER EQUIPMENT IN ENCLOSURE

5.4.1 For each pump forming part of the building hydrant system, the following equipment shall be housed in the enclosure as part of a unit conforming to IP 65 of AS 60529:

(a) Pump start switch marked either 'DIESEL PUMP START' or 'ELECTRIC PUMP START'; and

(b) A red pump running lamp marked 'HYDRANT PUMP RUNNING'.

There shall also be an indelibly marked sign in a clearly visible position in letters at least 25 mm high stating as follows:

CHARGE FEEDERS BEFORE STARTING PUMP

5.4.2 On hydrant systems incorporating pumps, there shall be within the enclosure, a 100 mm pressure gauge fed from a tapping on the hydrant system downstream of the pump delivery check valve.

The gauge shall be marked 'HYDRANT SYSTEM PRESSURE'.

5.5 CONNECTION PIPE TO SYSTEM

Inlet couplings shall be connected to a manifold and in turn be connected to the hydrant system via a non-return valve. Alternatively, individual inlet couplings may be fitted direct to individual resilient seated non-return valves. No part of the waterway shall be of a diameter smaller than the inlet coupling. Sharp bends are not permitted. A 15 mm stop valve shall be provided in the enclosure to release pressure in the pipework between the inlet flap valves and the non-return valve.

5.6 FIRE SERVICE REFERENCE DOCUMENTS

5.6.1 A diagram of the hydrant system showing all valves, building hydrant outlets, pressure control devices, and pumps, using the drawing conventions illustrated in Appendix E shall be placed in a water resistant ring binder and located in the building hydrant inlet enclosure. The diagram shall include the settings of all pressure reducing valves and the flow and pressure characteristics of each fire pump at design flow.

5.6.2 A copy of the manufacturer's pump curve for each pump shall be included in the binder.

5.6.3 The binder shall be clearly labelled 'BUILDING HYDRANT SYSTEM – DETAILS' and all pages shall be enclosed or encapsulated in such a way that the contents can be read without removal and are waterproof.

5.7 DUPLICATED BUILDING HYDRANT INLETS

Where duplicated inlet enclosures are provided, each inlet assembly shall be connected to the entire hydrant system and comply in all respects with 5.1 to 5.6 inclusive.

Where there are multiple fire hydrant inlet assemblies within a single building complex, they shall be interlinked so that any inlet may be used to serve any building hydrant outlet.

Unless otherwise approved by the National Commander, where there are multiple risers within a single building complex, they shall be interlinked so that any inlet may be used to serve any building hydrant outlet.

5.8 TEST OUTLETS

The test outlets shall be designed and installed to permit the attachment of flow measurement equipment sized for 110% of the maximum design flow.

6 PIPEWORK AND PRESSURE CONTROL

6.1 PIPING SIZING

Piping forming the waterway of the hydrant system shall be sized, using hydraulic calculations, so that the design criteria set out in section 3 will be achieved taking account of the available pressure provided by the New Zealand Fire Service (see Appendix D) and by booster pumps (where installed). However the main waterway shall not be less than 100 mm nominal bore.

The method of calculation shall conform to 6.4.

6.2 PRESSURE CONTROL AND TEST FACILITIES

6.2.1 The pressure at every building hydrant outlet coupling shall, under any conditions of flow from zero to the highest building hydrant outlet design flow (see 3.3) at the coupling (and from zero to the system design flow in the array of which the coupling forms part), be in the range of 600 kPa to 1200 kPa. For extensions to existing systems where building hydrant outlet couplings are single-lugged, the permissible pressure range shall be 600 kPa to 1050 kPa.

6.2.2 If conformance to 6.2.1 requires pressure control devices, these shall conform to the following:

(a) Orifice plates, ratio valves, and parity valves are not permitted;

(b) Individual building hydrant outlets may be controlled by a pressure reducing valve unique to that building hydrant outlet (see figure 8);

(c) Several building hydrant outlets arranged in a pressure zone may have common pressure control using a single pressure reducing valve provided that:

(i) The pressure reducing valve is not located in a position vulnerable to impact damage

(ii) Pressure reducing valves are accessible for inspection (without causing damage to the building or interior finishes) and provided with facilities for testing for correct operation in situ while flowing a range of flows between a single hose stream as specified in 3.3 and the design flow for that zone. Suitable provisions to permit this testing shall be provided (see figure 9)

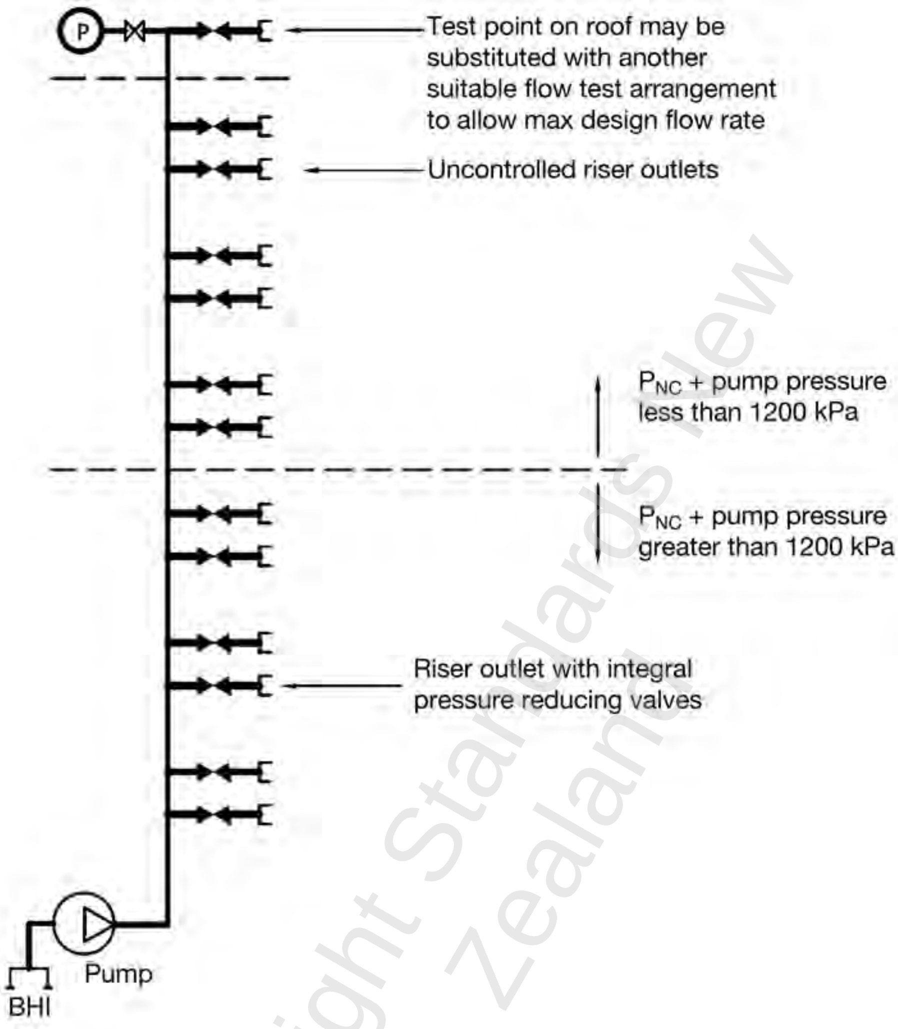
(iii) Isolation valves shall be fitted to both sides of each pressure reducing valve to permit isolation, commissioning, testing, and maintenance. These shall be locked open. The stop valves may be supervised for interference via any building fire alarm system;

(d) Pressure reducing valves shall have the intended pressure settings indelibly marked using an engraved label;

(e) Multistaged pumps shall have multiple pump discharge nozzles (see figure 10).

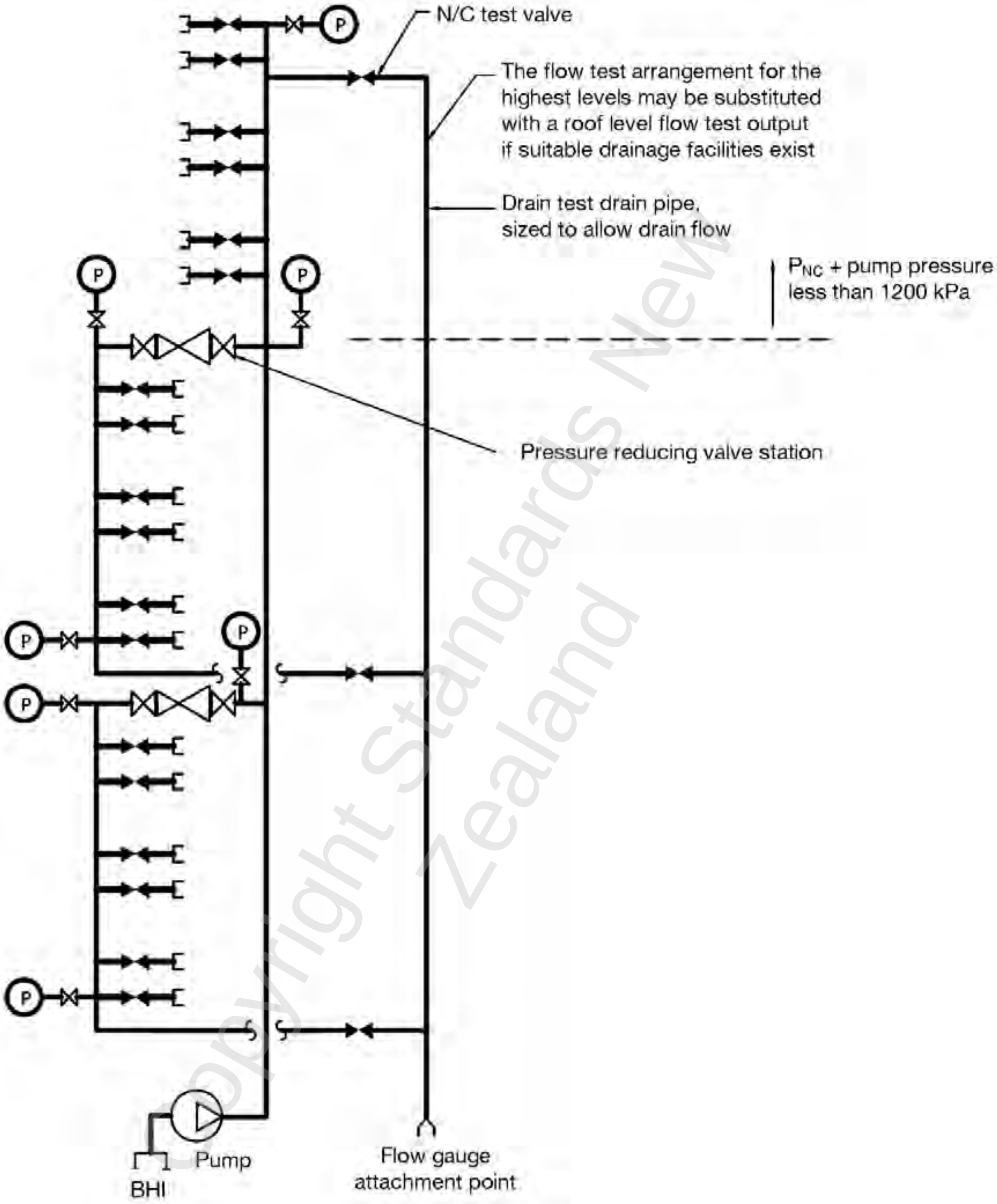
Combinations of the options given in (b) to (e) shall be permitted.

Figures 8 to 10 show possible options for pressure control of individual building hydrant outlets (when required).



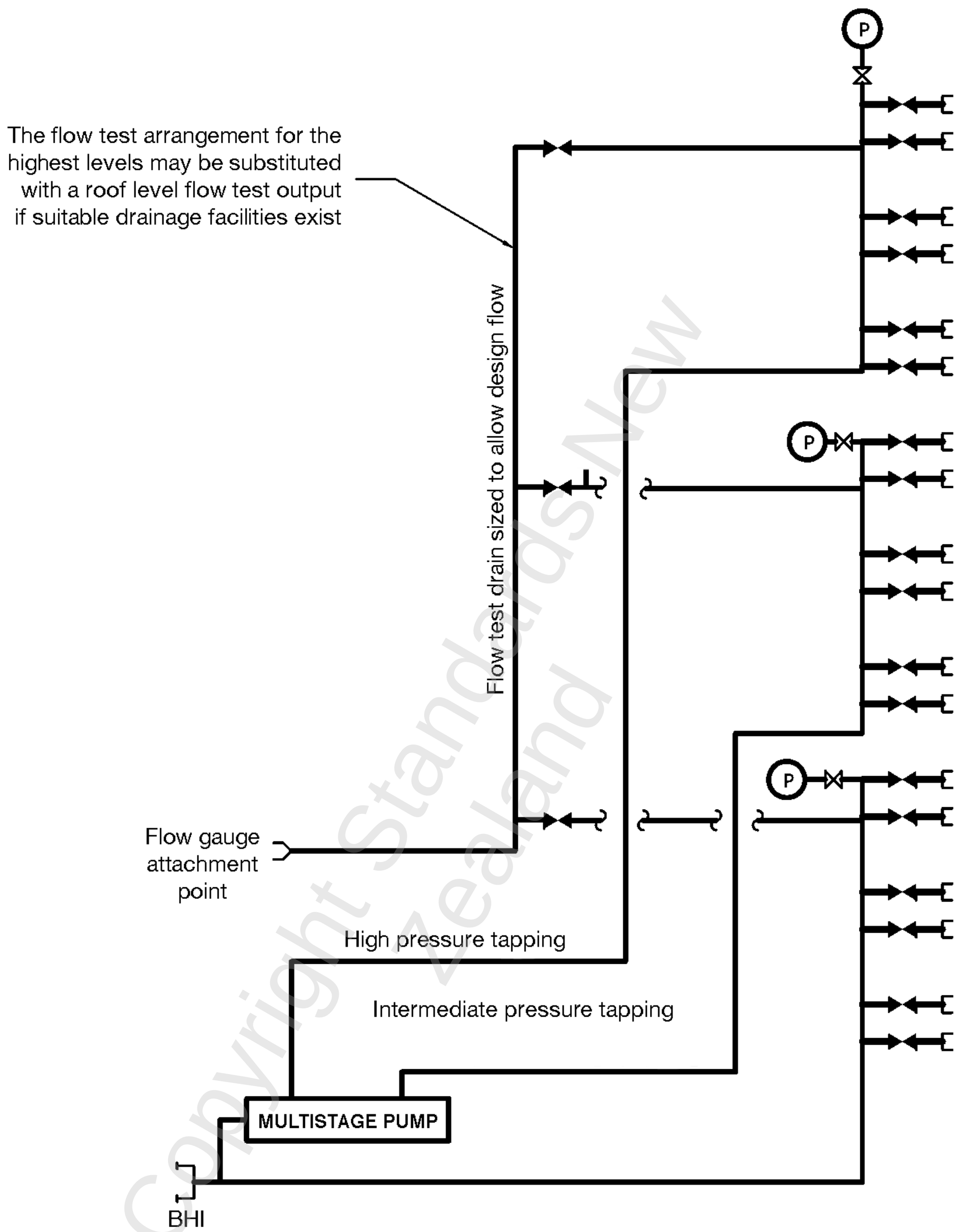
NOTE – See 1.4.1 and Appendix E for meaning of abbreviations and graphical symbols.

Figure 8 – Pressure control on individual outlets



NOTE – See 1.4.1 and Appendix E for meaning of abbreviations and graphical symbols.

Figure 9 – Zone pressure replacing zones



NOTE – See 1.4.1 and Appendix E for meaning of abbreviations and graphical symbols.

Figure 10 – Multistage pump pressure control

6.2.3 In addition to test facilities referred to in 6.2.2, permanent facilities shall be provided to allow the design flow through each leg including each pressure zone of the hydrant system (see figures 8 to 11).

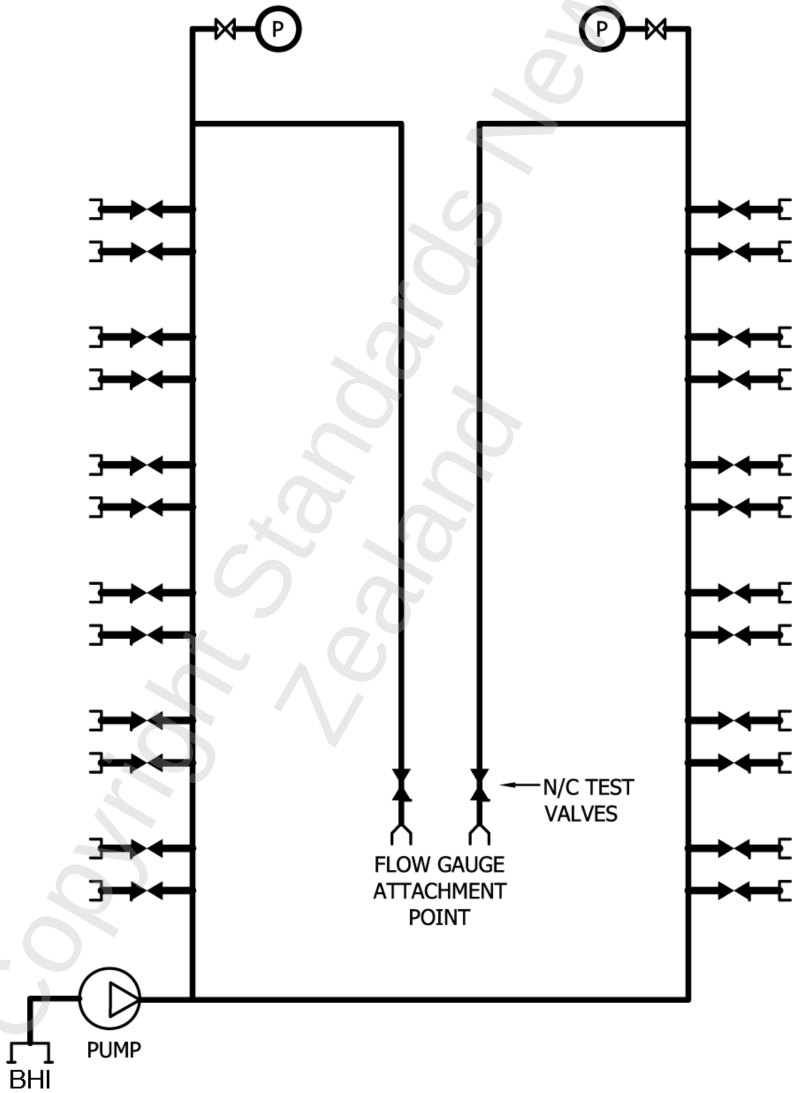
This facility shall be sized to allow a flow range of between zero and 110% of the design flow through the system to be safely discharged to waste.

The flow test facility shall include the following arrangements:

(a) A 15 mm valved tapping for a pressure gauge at the discharge point, located upstream of the isolation valve;

(b) Valved tappings of 15 mm for pressure gauges at the high points of each leg of the hydrant system, located in an area accessible to testing staff;

(c) Appropriate fittings as specified in 6.2.4 to allow flow test facilities to be temporarily connected without having to shutdown the hydrant system.



NOTE – See 1.4.1 and Appendix E for meaning of abbreviations and graphical symbols.

Figure 11 – Indicative flow test arrangements for buildings with multiple risers

6.2.4 For a flow test facility designed for a maximum flow of not exceeding 3000 L/min, an appropriate fitting for the attachment of a flow test gauge shall consist of a 70 mm double lugged, female instantaneous coupling. This coupling shall be fitted with a blanking cap, and shall be labelled in 25 mm contrasting letters, 'HYDRANT TEST POINT – NOT FOR FIRE SERVICE USE'.

For hydrant systems designed for flows exceeding 3000 L/min, an appropriate flow test gauge attachment points shall consist of a 100 mm roll groove connection. This roll groove connection shall be fitted with a blanking cap.

The flow test gauge attachment outlets shall be controlled by a handwheel operated, resilient seated, isolation valve.

The flow test attachment outlets shall allow for the safe disposal of water used for flow testing.

If the discharge from testing falls in part or in total on the roof of the building, adequate permanent drainage shall be available so that at 110% of the design flow, no damage will occur. In such cases, a written statement from the designer of the building stating that the roof guttering system will cater for the expected testing flows shall be provided to the HSC.

6.3 GAUGES AND VALVES

6.3.1 Pressure gauges shall comply with BS EN 837-1 or DIN 16005, or equivalent, be calibrated in kPa and have a scale range not more than 150% of the highest pressure to which the gauge will be subject (see 2.6 on labelling). Dampening shall be provided where required, to avoid excessive needle fluctuation. A stop valve shall be provided at each pressure gauge to allow removal without shutdown of the piping to which it is connected.

The requirement for gauge isolation valves also applies to gauges fitted as part of a pump controller.

6.3.2 Manually-operated valves (other than quarter-turn valves) shall be right hand closing with the direction of closing clearly indicated and ball valves and other quarter turn valves shall have a stop to prevent operation through greater than a 90° arc.

6.3.3 Each valve shall have an indicator so that it can be seen when the valve is fully open and fully closed. The valve shall be labelled for the correct normal position.

6.3.4 Valves associated with the waterway, through and around pumps, drain and test valves, shall be padlocked in the normal operating position (see 2.6 on labelling). This requirement does not apply to any valve fitted to the BHI.

6.3.5 Isolating valves are not permitted in the waterway other than:

(a) Those on the suction and delivery of pumps;
(b) Those located on either side of a pressure reducing valve;
(c) Those fitted to allow the isolation of waterways with multiple branches to permit maintenance on part of the hydrant system. In such cases these valves shall be supervised via the building fire alarm panel.

NOTE – In 6.3.5 (c) such valves are permitted but not mandated.

6.3.6 Pressure reducing valves and isolating valves shall be of a listed type.

6.3.7 All valves shall be rated for the pressure range to which they will be subject.

6.4 HYDRAULIC CALCULATION

6.4.1 The pressure and flow requirements of a hydrant system shall be calculated with pressure loss determined in accordance with 6.4.3. The hydrant system certifier may accept computer calculations generated by a program suitable for hydraulic calculations, subject to receiving a printout of inputs and outputs.

6.4.2 Pressure loss due to friction in piping shall be calculated using the (Hazen Williams) formula in equation 3:

$$\Delta P = \frac{0.605 Q^{1.85} \times 10^{8}}{C^{1.85} \times d^{4.87}} \quad \text{.........(Eq. 3)}$$

where

ΔP is the loss of pressure per metre of piping (kPa)

Q is the flow rate (L/min)

d is the mean inside diameter (mm)

C is a constant according to the internal roughness of the piping as derived from table 6.

Table 6 – Hazen Williams ‘C’ values

Type of piping	‘C’ value
Steel, black or galvanised	120
Copper	140
Stainless steel	140

6.4.3 Pressure loss in piping fittings shall be based on equation 3 with the equivalent length (in metres) determined by multiplying the nominal diameter (mm) of the smallest piping connected to the fitting, by the factor obtained from table 7.

Table 7 – Equivalent length factors for various fittings

'C' value (from table 6)	120	140
Tees into branches	0.060	0.080
Elbows	0.030	0.040
Bends (see Note 1)	0.015	0.020

NOTE –
(1) A 'bend' is a fitting where the radius of the turn, divided by the nominal piping diameter is at least 1.5.
(2) Pressure loss arising from flow through valves or other waterway devices including hydrant inlet fittings shall be calculated according to published manufacturer's data.

6.4.4 Pressure loss or gain due to difference in elevation shall be calculated as 10 kPa per metre difference in height.

6.4.5 In order to demonstrate that the design criteria (see section 3) will be achieved, a set of hydraulic calculations shall be provided for the hydrant system certifier. The calculations shall incorporate a dimensioned node diagram of the hydrant system waterway, as built, including details of pumps (where included), pressure control valves, and all fittings.

6.4.6 The following shall also be an acceptable method of calculating the pressure and flow characteristics:

(a) Determine the most hydraulically remote array of building hydrant outlets required by section 3 to be considered in simultaneous operation;

(b) Assume a single hose stream flow as specified in 3.3 at 600 kPa at each coupling of the most hydraulically remote building hydrant outlet;

(c) Calculate the loss/gains of pressure (ΔP_3) between the couplings of the building hydrant outlet (with both couplings flowing) to the piping junction serving the next building hydrant outlet in the array under consideration;

(d) Repeat step (c) for the next building hydrant outlet to give ΔP_4 but adjust the flow in the branch having the lower calculated pressure loss using the formula:

$$Q_2 = \sqrt{\frac{\Delta P_4}{\Delta P_3}\ x\ Q_1} \quad \text{.......(Eq. 4)}$$

(e) Add Q_2 and Q_1 and calculate to the next junction, then repeat the process for the balance of the array;

(f) Using the calculated flow for the array, calculate the pressure requirement at the system reference point – that is either the downstream end of the building hydrant inlet or, where fitted, at the discharge flange of each pump. Allowance shall be made in the calculation for pressure control devices.

If there is no pump, the pressure required at the reference point may not exceed P_A in equation 2;

(g) In calculating ΔP_l

(i) Assume that 1 x 30 m length of 90 mm lined hose will be used between the fire appliance and each coupling of the building hydrant inlet required by 5.3.2 and table 5.

Assume that the flow in each such hose connection is 1760 L/min (or in some single-storey buildings 880 L/min – see table 5) according to the total system design flow, and that the pressure loss due to friction is accordingly 60 kPa (or 20 kPa for 880 L/min)

(ii) Assume the flow rate through each inlet coupling in service is equal, and not greater than 1760 L/min and calculate the pressure loss across the assembly between the level of the inlet and the surface of the hardstanding area within 25 m of the inlet which may be used by the fire service appliance.

NOTE – This provides an example of a calculation method based on flows for non-sprinklered buildings. The flows would need to be adjusted to those specified in this Standard for the respective system design.

6.4.7 The hydraulic calculation shall also demonstrate that the available pressure at every building hydrant outlet on the hydrant system will comply with 6.2.1. For systems incorporating booster pump(s) this shall be demonstrated with pump(s) operating.

NOTES

7 PUMPS

7.1 PUMP UNIT

7.1.1 A pump unit consists of a listed pump, listed motor, listed controller, and a unit frame.

7.1.2 The pump unit and driver shall be assembled so that:

(a) The mounting on the frame shall allow either driver or pump to be removed without disturbing the other and the impeller to be withdrawn without removing the driver or pump body;

(b) There shall be ready access for checking the alignment of resilient couplings when the installation is complete;

(c) Cement grout or oil resistant flexible pads shall be provided under the frame unless the manufacturer's instructions state otherwise. Care shall be taken not to distort the frame when bolting it down;

(d) The alignment shall be checked to be in accordance with the manufacturer's specification after the pump frame is installed, bolted down, and pipework connected;

(e) The pump and driver shall be in line direct or close coupled, and the coupling shall be rated for the maximum torque of the driver under all conditions, and of a design so that if any elastomeric element used in the coupling to absorb vibration should fail, the pump shall continue to be driven under all operating conditions.

7.2 PUMPS

7.2.1 Only listed rotodynamic pumps shall be used;

(a) Factors that shall be considered for any listing are:

(i) Materials and construction

(ii) Performance range and accuracy against the manufacturer's curve

(iii) Availability of documentation;

(b) Every application for listing of a pump shall be accompanied by the following:

(i) Details of construction

(ii) The discharge versus power absorbed at duty speed

(iii) The net positive suction head required (NPSHR) versus discharge at duty speed

(iv) The total head versus discharge at various speeds and impeller diameters

(v) The maximum impeller width and diameter;

(c) Where the pump outlet is fitted with a pressure relief valve for pressure relief purposes, the pump casing rating shall be not less than the set pressure of the relief valve plus 300 kPa;

(d) Where no pressure relief valve is fitted the pump casing rated pressure shall be at least equal to the highest head on the pump curve at duty speed (no flow) plus P_{NC}, plus the static difference between the building hydrant inlet and the pump suction, plus 300 kPa.

7.2.2 The published manufacturer's curve of the selected pump shall demonstrate that:

(a) At the hydrant system design flow, the pump will produce 110% of the additional pressure needed (P_R) at the point of connection to the water supply of the pump inlet flange in order to meet the pressure required at the reference point (see 6.4.6(f));

(b) At 150% of the hydrant system design flow, the pump will produce at least 65% of the pressure available (on the manufacturer's curve) at the P_R and, when driven by the selected driver the pressure will fall progressively with the rate of flow;

(c) The maximum head of the pump curve shall not be greater than 120% of P_R. However, to achieve this, it shall be permissible to use a pressure relief valve on the pump discharge, arranged to relieve to the pump suction;

(d) Where there are pumps in parallel, the curve of each pump shall show a constantly reducing head as flow increases;

(e) If more than one pump is diesel driven, the pumps shall have identical curves.

7.2.3 The pressure available at the pump suction inlet (PS) shall be calculated using equation 5.

$$P_S = P_{NC} - \Delta P_I - \Delta P_2 \pm \Delta P_H \quad \text{(Eq. 5)}$$

where

P_{NC} is the maximum assumed pressure at fire service pumping appliance outlet (see Appendix D)

ΔP_I is the pressure loss in the feeder hose and inlet assembly (see 6.4.6 (g))

ΔP_2 is the pressure loss in the waterway between the inlet and the pump suction at the design flow (Q) using the formula given in equation 3 in 6.4.2.

ΔP_H is the pressure gain or loss due to difference in height between the inlet assembly and the pump suction.

7.3 DRIVERS

7.3.1 Single and twin pump arrangements

7.3.1.1

Where only one pump is required (see 3.4), the driver may be either:

(a) A diesel-driven pump; or

(b) Where the required pump duty is less than 0.15 P_{NC}, an electric motor driven pump with the power supply from an electrically reliable and physically secure source.

7.3.1.2

If two pumps are required, one shall be a diesel-driven pump and the other may be either:

(a) A diesel-driven pump; or

(b) An electric motor driven pump.

NOTE – In 7.3.1.1 and 7.3.1.2 the use of an engine-driven emergency generator in conjunction with an electrically driven pump does not constitute a substitute for a direct coupled diesel-driven pump.

7.3.2 Electric motors

7.3.2.1

Electric motors, where used shall be of the three-phase, low voltage, squirrel cage, drip-proof, or totally enclosed type.

7.3.2.2

The motor shall have 110% of the capacity required to ensure that the continuous rated current is not exceeded under any conditions of pump discharge when power is being supplied at the nominal voltage. Should the motor have a service factor of 10% or greater, this requirement shall be deemed to have been met.

NOTE –

(1) This 10% capacity margin is necessary to take account of fluctuations in the supply voltage that will increase the current.

(2) Attention is drawn to the need to check the actual pumpset turning speed to ensure that the motor can provide the power absorbed by the pump at that speed.

7.3.2.3

The locked rotor current shall not exceed 750% of the full load current of the motor.

7.3.2.4

The motor shall have a nameplate attached to it, on which is indelibly marked the:

(a) Manufacturer's name;
(b) Type and serial number;
(c) Continuous rated power output;
(d) Working voltage and frequency;
(e) Rotational speed at full load; and
(f) Full load current.

7.3.2.5

The pump unit shall be so mounted that no current carrying part of the motor is less than 150 mm above the floor.

7.3.3 Electric motor controllers

7.3.3.1 Component parts and listing

An electric motor controller shall be a listed device the component parts of which are:

(a) A cabinet supporting or enclosing items (b) to (g);
(b) Manual start and stop buttons;
(c) A start contactor;
(d) Power supply supervisory equipment;
(e) Overload protection supervisory equipment;
(f) Pump running alarm switching devices; and
(g) A nameplate showing the following information:
  (i) Name of manufacturer
  (ii) Unit number
  (iii) Pump make, model, turning speed, and impeller diameter, and
  (iv) Duty flow and pressure.

7.3.3.2 Location

The controller shall be located in the pump unit enclosure as close as practicable to the motor with all electrical components at least 450 mm above the floor.

7.3.3.3 Start contactor

The following requirements apply:

(a) The motor starting method shall be by a direct on line electromechanical contactor, except where the power supply is insufficient to allow direct on line starting. Then either of the following may be used:
 (i) An approved electronic variable power soft starter, or
 (ii) An approved electronic variable frequency starter and speed controller, provided it is arranged to fail into direct on line frequency and voltage mode;

(b) The current rating of the contactor shall be at least 125% of the nameplate continuous current rating of the motor; and

(c) The short circuit category of duty shall be AC-3 to IEC 60947-4.

7.3.3.4 Overload protection

The following requirements apply:

(a) The thermal overloads shall be arranged to reset automatically. They shall be capable of adjustment to carry 30% more than the nameplate continuous current rating of the motor;

(b) An adequate setting may be demonstrated by five successive pump starts at 20 s intervals without tripping, with the pump test return valve part open;

(c) The thermal overloads shall be supervised in such a way as to comply with 7.3.3.5;

(d) Motor winding temperature sensors, if fitted, may be used to operate a motor overheat alarm but they shall not automatically trip the motor contactor.

7.3.3.5 Supervisory monitoring

The following requirements apply:

(a) Approved supervisory monitoring of all of the following conditions shall be provided:
 (i) Pump running
 (ii) Loss or reversal of any phase at the line terminal of the contactor
 (iii) Opening of any section of the contactor control circuit except the start button; and

(b) Except in the case of (a)(i), the absence of the above conditions (that is, normal state) shall be indicated on the face of the motor controller by means of continuous visual indicators;

(c) The detection of a pump running condition as specified in (a)(i) shall cause a set of clean changeover contacts to switch;

(d) The detection of any of the conditions specified in (a)(ii) and (iii) shall after approximately 120 minutes cause a set of clean changeover contacts to switch. A test device shall be incorporated to compress the gating time to approximately 12 s; and

(e) A listed alarm device, in an approved location external to the pump unit enclosure, shall be connected to the supervisory device. The alarm shall be labelled 'BUILDING HYDRANT PUMP RUNNING/MALFUNCTION ALARM', followed by instructions on who to contact.

NOTE – It is suggested that the 'BUILDING HYDRANT PUMP RUNNING'/'MALFUNCTION ALARM' alarm should generally be located at the BHI, unless another location can be shown to be more appropriate (such as a normally staffed location).

7.3.4 Power supply

7.3.4.1 Source

The following requirements apply:

(a) The power supply shall be obtained from an electrically reliable and physically secure source, preferably from a public supply by an exclusive separate connection;

(b) Where a suitable public supply is not available, approval of the generating plant shall be obtained;

(c) Where a separate connection from the public supply is not provided, a separate circuit shall be taken from a point on the line side of a switch by which all other electrical services in the premises can be isolated to directly and exclusively supply the pump motor, motor starter, and other ancillary services in the pump room; and

(d) Conductors shall be appropriately sized to meet the motor manufacturer's requirements for nameplate voltage.

7.3.4.2 Security

The following requirements apply:

(a) There shall not be any switches on the circuit supplying the pump between the isolator on the pump unit controller and the point at which it is connected to the main supply;

(b) All switches on the protected premises which are capable of isolating the pump shall be clearly labelled 'BUILDING HYDRANT PUMP – LEAVE ON' in white letters on a red background; and

(c) The normally open circuit wiring between the pump contactor and the motor shall be protected against physical damage.

7.3.5 Diesel engines

7.3.5.1 Listing of engine

A listed diesel engine of a compression ignition direct injection type shall be used and may be naturally aspirated, super- or turbo-charged and/or intercooled. Engine intercooling shall be in accordance with the engine manufacturer's recommendations. Single cylinder engines are not permitted. Only those engines for which spare parts are likely to remain readily available may be listed.

7.3.5.2 Power

The following requirements apply:

(a) The engine shall be able to produce 110% of the power requirement for the hydrant system design flow when measured against the manufacturer's continuous power rating as defined in Part 1 of BS ISO 3046 or equivalent Standard approved by the HSC. The power requirement at the hydrant system design flow shall include an allowance equal to the power absorbed by any supplementary devices driven by the engine; and

(b) Any ratings or deratings specified by the engine manufacturer shall be observed. In the absence of manufacturer's data the engine shall be derated in kilowatts at the rate of 1.5% for every 100 m of altitude over 200 m above sea level.

7.3.5.3 Performance and commissioning

The engine shall be able to be started at an engine room temperature of 5°C and shall accept full load within 30 s of receiving the signal to start. On *in situ* commissioning, the pump unit shall be run for a period of at least one hour on increasing load up to duty flow. During this commissioning period at least 10 consecutive starts shall be completed.

7.3.5.4 Governing

The engine shall be provided with a governor to control the engine speed within 10% of its rated value under all stable conditions of load up to full load rating.

7.3.5.5 Heating

Where the pump unit enclosure is not automatically maintained at a temperature above 10°C, the engine shall be artificially heated by an approved device so as to maintain an engine temperature of at least 25°C where:

(a) Either the minimum ambient temperature or the minimum engine temperature is maintained by devices dependent upon electrical power, provision shall be made to raise an alarm at an approved place in the event that temperatures drop below the point at which the engine could be relied upon to start;

(b) The temperature sensing and alarm devices shall be listed and shall not depend upon mains electric power. If the alarm device can also be triggered by other supervisory functions, there shall also be a local, labelled, latching indication of the source of the alarm;

(c) A HSC may waive this requirement if ambient temperatures are not expected to drop to this level.

See also 7.6.8 and 7.6.9.

7.3.5.6 Engine cooling

The engine shall be cooled by transferring the excess heat, either to air automatically vented to outside the pump house in a manner which complies with 7.3.5.6.1, or to water from the pump delivery discharged to waste in a manner which complies with 7.3.5.6.2.

Under full load running conditions, with all doors and windows in their normal positions, the rise in ambient pump room air temperature, measured close to and at the level of the aspirating air intake, shall not exceed 18°C over a one-hour period.

7.3.5.6.1 Air cooling

Where motors are cooled by air the following requirements apply:

(a) Direct

The fan for direct air cooling shall be mounted on the engine crankshaft or be gear or multiple-belt driven directly from the crankshaft. The rated capacity of the belts shall not be exceeded if one belt fails;

(b) Indirect

A radiator shall be resiliently mounted in accordance with the motor manufacturer's recommendations, designed for stationary service and with all of the following facilities:

- (i) A shaft, gear, or belt-driven fan that pushes the cooling air away from the motor
- (ii) A shaft, gear, or belt-driven coolant circulating pump
- (iii) The radiator header tank shall be fitted with the motor manufacturer's overflow/makeup tank and shall have a means of readily checking the level of coolant in it
- (iv) The engine manufacturer's coolant circuit shall be used
- (v) The radiator may require to be adequately ducted to control pump enclosure temperatures and/or ensure that adequate fresh cooling air is drawn through the radiator;

(c) Ducting forming part of the air cooling arrangements shall be sized so that the pressure drop across the ducting does not exceed 80% of the maximum recommended by the manufacturer. Ducts shall discharge to a safe place outside the pump enclosure; and

(d) Any louvre forming part of, or required by, the air-cooling system shall operate automatically and if dependent on an electrical supply shall fail in the open position.

7.3.5.6.2 Water cooling

Where motors are cooled by water the following requirements apply:

(a) Cooling water supply, control, and discharge:

- (i) Water to cool the engine shall be taken from the pump delivery to two isolation valves
- (ii) One isolation valve shall be strapped open to supply the normal cooling circuit and be labelled 'MOTOR COOLING, NORMALLY OPEN'
- (iii) The cooling water shall then pass through an easily accessible strainer, labelled 'CLEAN MONTHLY'. It shall have a screen that can be removed without taking the strainer out of the pipework. The screen shall have holes in it not less than 2 mm or greater than 5 mm in any dimension and the total screen area shall be equivalent to at least eight times the cross-section area of its supply pipe
- (iv) The strainer shall be fitted with a listed device that automatically bypasses it should the strainer become blocked
- (v) A flow-regulating device where required shall be fitted downstream of the strainer
- (vi) Where the suction head would cause water to flow through the cooling circuit when the pump is not running, a listed flow control device may be fitted downstream of the strainer

(vii) The other isolation valve shall enable cooling water to bypass items (iii) and (iv) and shall be strapped shut and labelled 'OPEN FOR EMERGENCY COOLING, NORMALLY SHUT'. This valve shall discharge into the motor cooling system upstream of the flow indicator

(viii) The cooling water shall then flow through a listed water-flow indicator

(ix) If the engine requires a coolant circulating pump it shall be shaft, gear, or belt driven

(x) The discharge pipe from the heat exchanger shall be at least one size larger than the inlet pipe. There shall be a flexible connection between the pipework and the engine cooling system or heat exchanger

(xi) The cooling water assembly shall be of an indirect heat exchanger type;

NOTE – To comply with this item, a listed pump unit manufacturer may obtain a listing for a generic cooling system in which the makes and models of the components are nominated together with pipe sizing, fittings and labelling requirements.

(b) Indirect heat exchangers
The cooling water assembly may discharge into the secondary circuit of a suitably sized heat exchanger which shall be capable of withstanding the maximum supply pressure that can be applied. The primary cooling circuit shall have a header tank with a water volume at least equivalent in capacity to the engine's cooling jacket. The primary cooling circuit shall be connected to a suitable automatic overflow/make-up tank. The header tank shall have a means of readily checking the level of coolant in it;

(c) No part of the engine's waterjacket shall be subject to a pressure of more than 100 kPa;

(d) If any part of the heat exchanger system is not part of the original equipment manufacturer (OEM) the design shall be approved by the engine manufacturer.

7.3.5.7 Electric starter motor

The engine shall be provided with the manufacturer's specified electric starter which shall be nominated in motor listing. The electric starter motor shall be able to crank the engine continuously for 60 seconds followed by one restart, without failure.

7.3.5.8 Emergency start device

In addition to a manually-operated starting button, each diesel engine shall have an approved means by which it can be manually started in an emergency. The following are acceptable:

(a) A manual crank handle provided that sufficient energy can be imparted to the fly wheel to enable it to carry the engine through at least two compression strokes when the decompression lever is released. Any device used to assist manual starting shall return to the automatic start position when released. The entire manual cranking operation shall be capable of being performed by one person;

(b) The electric starter motor used for automatic starting (or an additional listed electric starter motor) provided that it is fitted with an approved device which directly switches both batteries on to the solenoid of the starter motor. The operating lever for this device shall be labelled 'EMERGENCY STARTING' with an arrow to indicate the direction of operation and shall be painted green. It shall be spring-loaded and strapped in the released position.

7.3.5.9 Batteries

Two separate lead-acid starting batteries each capable of supplying the controller load for a period of not less than 24 hours, and thereafter capable of cranking the engine for 60 s shall be provided and be indelibly marked 'A' and 'B' and with the date of installation.

Both batteries shall be normally electrically isolated on their non-earthed side and simultaneously connected to the starter motor only for starting. They shall be located so as to give ease of access for hydrometer testing, be adjacent to, but not over any part of, the pump unit and be protected with a strong non-conductive cover. They shall be secured in accordance with 2.4.

The batteries shall be suitable for continuous operations under float charge conditions, designed for stationary engine starting use, have a minimum service life of three years, and comply with AS 2149 or equivalent.

7.3.5.10 Combustion air

The air intake shall be fitted with an adequate filter.

7.3.5.11 Exhaust

Every engine shall have an exhaust which:

(a) Independently discharges to a safe location outside the pump unit enclosure and where the fumes will not impact on fire service personnel at the building hydrant inlet or fire sprinkler inlet;

(b) Has the outlet so positioned that it is guarded from the entry of rainwater and birds;

(c) Is provided with a flexible metallic connection between the exhaust manifold and the exhaust pipe. Where the exhaust pipe rises above the manifold, means shall be provided to trap any condensate and prevent it flowing back into the engine;

(d) Is provided with a screwed and plugged manometer hole in the exhaust manifold outlet to help the measurement of manifold pressure. Under full-load conditions, the pressure shall not exceed 7.5 kPa except where the manufacturer recommends a lesser maximum pressure;

(e) Has the exhaust pipe adequately supported from the building and kept at least 225 mm from combustible materials. Alternatively, it may be sleeved so that the pipe is at least 50 mm from the sleeve and the sleeve is at least 25 mm from combustibles and with the engine operating at full load, the temperature on the external surface of any exposed combustible material shall not exceed 70°C;

(f) Is fitted with an adequate silencer, preferably outside the pump unit enclosure;

(g) Has the exhaust pipe guarded if it is within 2 m of the floor and could cause injury. Proprietary exhaust pipe wraps shall be permitted to the exhaust pipe only (not manifold, turbo, and so on) provided the wrap is installed in accordance with the engine and the product manufacturers' instructions.

7.3.5.12

A drip-tray of lateral dimensions larger than the engine sump shall be provided under the engine.

7.3.6 Diesel engine controllers

7.3.6.1 Component parts

A diesel engine controller shall be a listed device consisting of a cabinet housing or supporting instruments, a controller logic unit, battery chargers, listed start pressure switches, a manually-operated start switch, a test logbook, a nameplate and such manual controls and technical data sheets as are specified. The electrical connection between the controller and the engine shall be made with a mechanically restrained multicontact plug and socket and the entire controller shall be listed. Removal of the plug from the socket shall cause an indication at an approved location. Where the indication is made at a location which is not staffed at all times, a defect signal shall be generated complying with 7.6.10.

7.3.6.2 Location

The controller shall be located in the pump unit enclosure close to, but physically separate from, the engine and pump. It shall be free from engine vibration. There is a need to comply with NZS 1170 Part 5 for restraint against seismic forces.

7.3.6.3 Cabinet

The cabinet shall be robustly constructed and provided with adequate ventilation to help dissipation of heat generated by electrical equipment. Cabinets shall include a dustproof compartment for the storage of technical data sheets and the test logbook.

7.3.6.4 Instruments, manual controls, alarms, and lamps

The information in table 8 shall be displayed in an easily seen and read form on the face of the controller. Analogue displays shall indicate the acceptable duty range by green shading and unacceptable levels by red shading. Tachometers should be digital, with the minimum number of display digits as specified in table 8, or an analogue tachometer of suitable scale.

The controller shall have instruments, manual controls, alarms, and lamps which shall enable the operator to determine information relating to the pumpset in an easily recognised manner as set out below:

(a) Digital displays shall have digits at least 15 mm high, and comply with the requirements of table 8.

Table 8 – Controller display information

Information	Min. no. of significant figures on digital displays
Pump suction pressure	3
Pump delivery pressure	3
Pump rotational speed	4
Engine run time (hour meter)	5
Engine lubricant pressure	3
Engine block temperature °C	3
Voltage of each battery	4
Charging current to each battery	3

Optionally, a single digital display may be used to annunciate:

(i) The voltage and charging current for each battery

(ii) The engine lubricant pressure and engine block temperature provided the display automatically defaults to annunciate any parameter in an alarm condition;

(b) A manual start button shall be provided in easily visible positions on the face of the controller;

(c) The following lamps or LED indicators shall be provided in easily visible positions on the controller to show:

(i) Whether each battery charger is energised

(ii) The controller unit status

(iii) The start logic controller status;

(d) All instruments, controls, and lamps shall have their functions clearly labelled. Where duplicate instruments associated with batteries are provided they shall be labelled either 'A' or 'B';

(e) Where remote annunciation is provided for off-normal conditions, for example:

(i) Pump running

(ii) Battery charger off

(iii) High engine temperature

(iv) Engine heating failure

(v) Low engine oil pressure,

an alarm unit shall be provided and mounted on the controller to assemble and transmit such signals either individually or collectively. A timing device may be incorporated to suppress such alarms for a period of 60 minutes provided that they will automatically reset.

7.3.6.5 Controller logic unit

The following requirements apply:

(a) A controller logic unit to control the automatic starting sequences of the pump unit shall be provided. Continuity of service and availability of spare parts for the unit shall be considered;

(b) Its functions shall comply with figure 12;

(c) Crankshaft speed shall be measured by a sensor driven directly by the crankshaft or a layshaft gear driven from it. The sensor device shall be considered part of the controller logic unit;

(d) If the unit incorporates polarity sensitive devices it shall be protected against or undamaged by reversal of its power supply polarity.

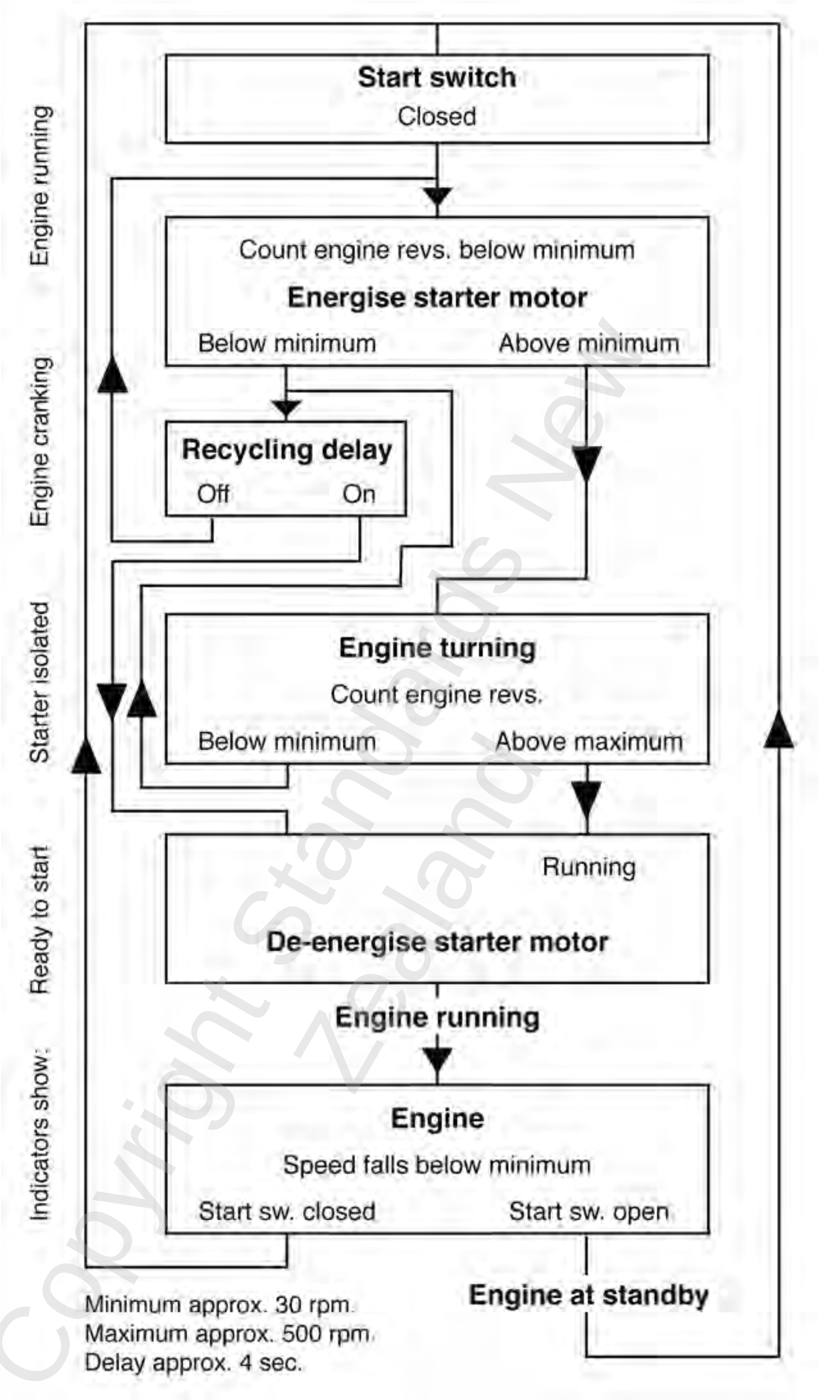


Figure 12 – Diesel engine controller logic unit

NOTE –

(1) '30 RPM' and '500 RPM' mean that the crankshaft is rotating at approximately the stated speed. Actual speeds are to be adjusted in accordance with the engine manufacturer's recommendations.

(2) 'Energise' means simultaneously connecting both batteries to the starter motor.

(3) 'Ready to Start', 'Starter Isolated', 'Engine Cranking' and 'Engine Running' are to be shown by status lamps or LED indicators.

7.3.6.6 Battery chargers

A listed constant voltage current-limited battery charger shall be provided within the controller cabinet for each of the two starting batteries. The battery chargers shall each:

(a) Have automatic output control that maintains the battery fully charged within the 'float' levels specified by the battery manufacturer;
(b) Have automatic control to limit the output current to the maximum rated value of the unit when lead acid batteries discharged to 1.85 V per cell are connected;
(c) Be capable of restoring the full nominal Ampere-hour capacity of the battery within a period of 24 hours while simultaneously supplying the full quiescent current (controller load);
(d) Be capable of tolerating continuous reversed polarity or short circuit on the output terminals without damage, and shall self-restore on removal of the adverse conditions;
(e) Provide a visual sign that the charger is energised.

The charger manufacturer shall specify any design constraints on charger output or the size and length of battery voltage sensing conductors. Compliance shall be required.

The 230 V mains supply for the controller and battery chargers shall be connected to a separate sub-circuit on the building's main distribution board which is clearly labelled 'BUILDING HYDRANT PUMP BATTERY CHARGERS'.

7.3.6.7 Nameplate

An engraved label shall be affixed to the face of the cabinet and give the following information:

(a) Name of pump unit manufacturer;
(b) Unit number;
(c) Duty speed;
(d) Engine make, model, and power at duty speed;
(e) Pump make, model, and impeller diameter;
(f) Flow and pressure at duty speed.

7.3.6.8 Operator's handbook and logbook

The following shall be kept in the cabinet:

(a) A copy of the electrical circuits associated with the controller logic unit, battery chargers, and engine;
(b) Manufacturers' operator handbooks for the pump, controller, and engine unit;
(c) An approved logbook for recording all faults and the results of all tests including engine maintenance, oil changes, battery condition, hours run, fuel consumption, and annual surveys.

A label showing the name and telephone number of the pump unit maintenance contractor shall be affixed to the inside of the cabinet.

7.3.7 Diesel engine fuel supply

7.3.7.1 General requirements

Every pump engine shall have its own individual fuel supply tank.

The relevant requirements of the Hazardous Substances and New Organisms (HSNO) Act shall be complied with, specifically those on tank size and attachments, pipes, protection of fuel lines, oil level gauges, and fuel secondary containment provisions.

7.3.7.2 Tank mounting

The tank may be mounted inside the pump house, but it shall be mounted separately from the engine with the fuel outlet not lower than the injector pump or more than 1000 mm above the injector pump, unless this voids the manufacturer's warranty. Tank mounting shall comply with 2.4.

7.3.7.3 Tank capacity

The fuel capacity shall be assessed on the engine manufacturer's specific fuel consumption for the power absorbed by the pump unit at duty rpm for a period of eight hours.

7.3.7.4 Fuel gauge

The tank shall be fitted with a listed gauge. The gauge shall be marked to show that the top quarter (by volume) of the tank is fuel for test running and the remainder is for building hydrant duty running. It shall also show that the fuel level shall not normally fall below that allowed for testing.

7.3.7.5 Tank construction

The tank shall be constructed of at least 1.5 mm mild steel coated internally with a suitable anti-corrosive and oil resisting coating after it has been tested for leaks, or alternatively of at least 1.25 mm stainless steel.

7.3.7.6 Tank connections

The following connections, none of which shall be galvanised pipe, shall be provided:

(a) A 25 mm vent pipe from the top of the tank that has a continuous upward grade to a down-turned flared and gauze-sealed vent outside the pump house;

(b) A minimum 20 mm filling pipe into the top of the tank. The tank may be filled only by pumping from a mobile tanker, storage tank, or a portable drum. A minimum 20 mm filling pipe fixed into the top of the tank for use by a mobile tanker may be supplied, provided that this fill pipe shall extend to the outside of the building, or other suitable location and have a suitable threaded and sized locked valve attached at the delivery end. Suitable precautions shall be taken to ensure that if the tank is overfilled, by a mobile tanker, that diesel is not discharged into the pump house;

(c) A 25 mm overflow pipe from the top of the tank which shall be carried on a continuous downward gradient to discharge in a safe place – usually the storage tank or a portable drum;

(d) A sludge sump at the lowest part of the tank, fitted with a normally closed and plugged stopcock;

(e) A sealed opening not less than 100 mm diameter for tank cleaning purposes;

(f) A minimum of a 10 mm fuel outlet drawing from at least 25 mm above the bottom of the sludge sump and fitted with a stop valve padlocked in the open position; and

(g) A fuel return line sized and installed in accordance with the engine manufacturer's recommendations.

7.3.7.7 Fuel secondary containment

Where required by the HSNO Act, provisions shall be made for diesel fuel secondary containment. One such method is to install the diesel fuel tank in a bunded area.

7.3.7.8 Fuel lines

The fuel lines shall be at least 10 mm seamless copper or stainless steel tube with double ferrule compression fittings, brazed joints, or black steel pipes and fittings, and shall:

(a) Be well protected and supported, preferably in a continuous down-gradient to the engine. However, it is permissible to have one low point, provided there is a continuous rise from this point to both the engine and the fuel tank;

(b) Incorporate a transparent agglomerator bowl, immediately downstream of the fuel line stop valve, to show the presence of water, and an accessible, engine mounted, filter;

(c) Terminate at the engine at a metal armoured flexible connection.

This clause does not apply to any fuel lines forming part of the engine manufacturer's OEM equipment.

7.3.7.9 Air lock avoidance

Care shall be taken to avoid air locks in the system. No air relief valves are permitted and where air relief is essential, screwed plugs shall be used.

7.4 PUMP STARTING AND STOPPING

7.4.1 Remote starting

Each pump shall have a remote control panel located in the building hydrant inlet enclosure.

The remote control panel shall conform to 5.4.1.and be connected to the building hydrant pump controller by means of fire-rated cable. The cable shall have a minimum 30 minute circuit integrity rating and shall comply with AS/NZS 3013 Classification WS22. Alternatively, the cable may be run in a fire-rated conduit or a fire-rated duct used solely for cabling and non-combustible services. The conduit, duct, or wall cavity shall have a minimum fire resistance rating of FRR -/30/-. The cable shall be protected from mechanical damage.

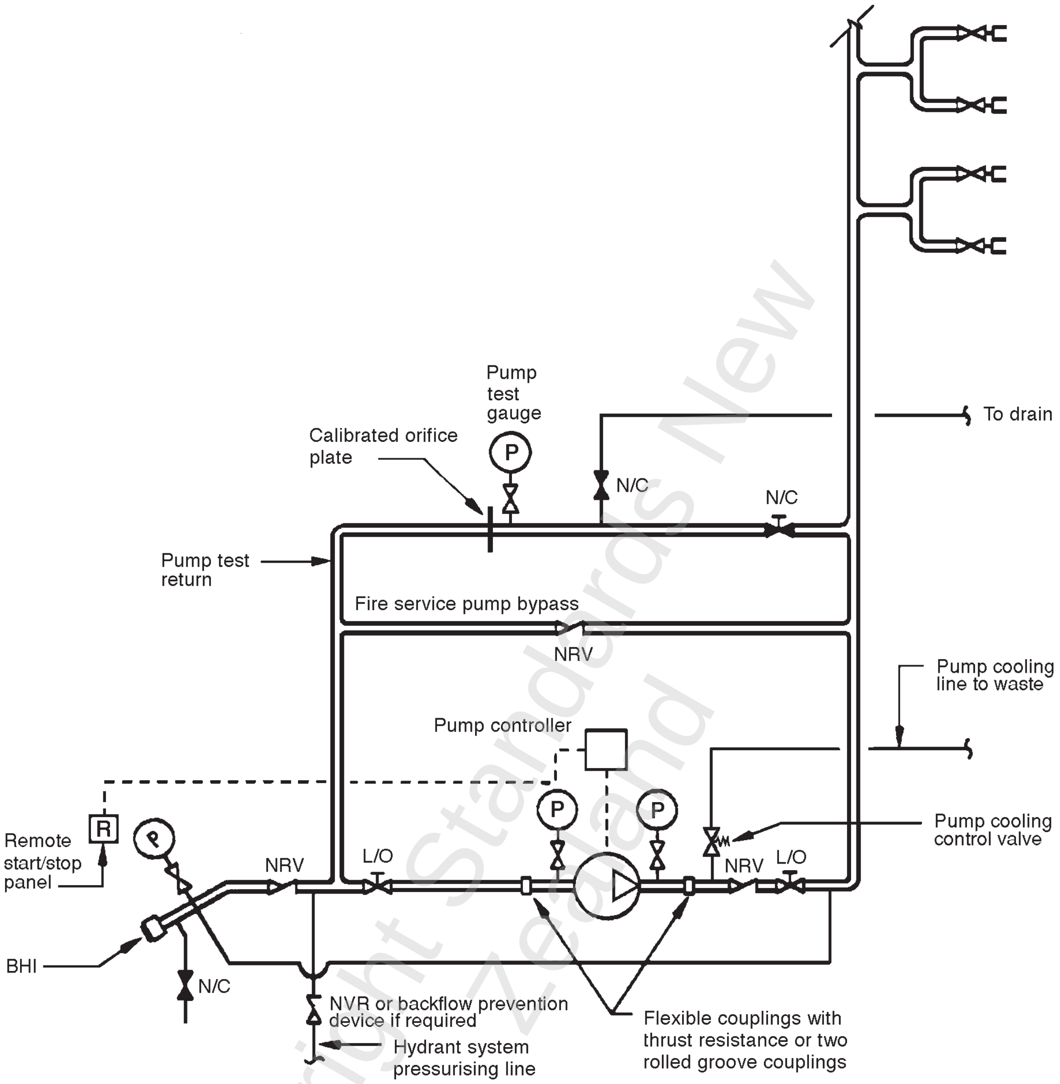
7.4.2 Manual starting

A labelled green manual start button shall be provided on the building hydrant pump controller to energise directly the starter contactors.

7.4.3 Stopping

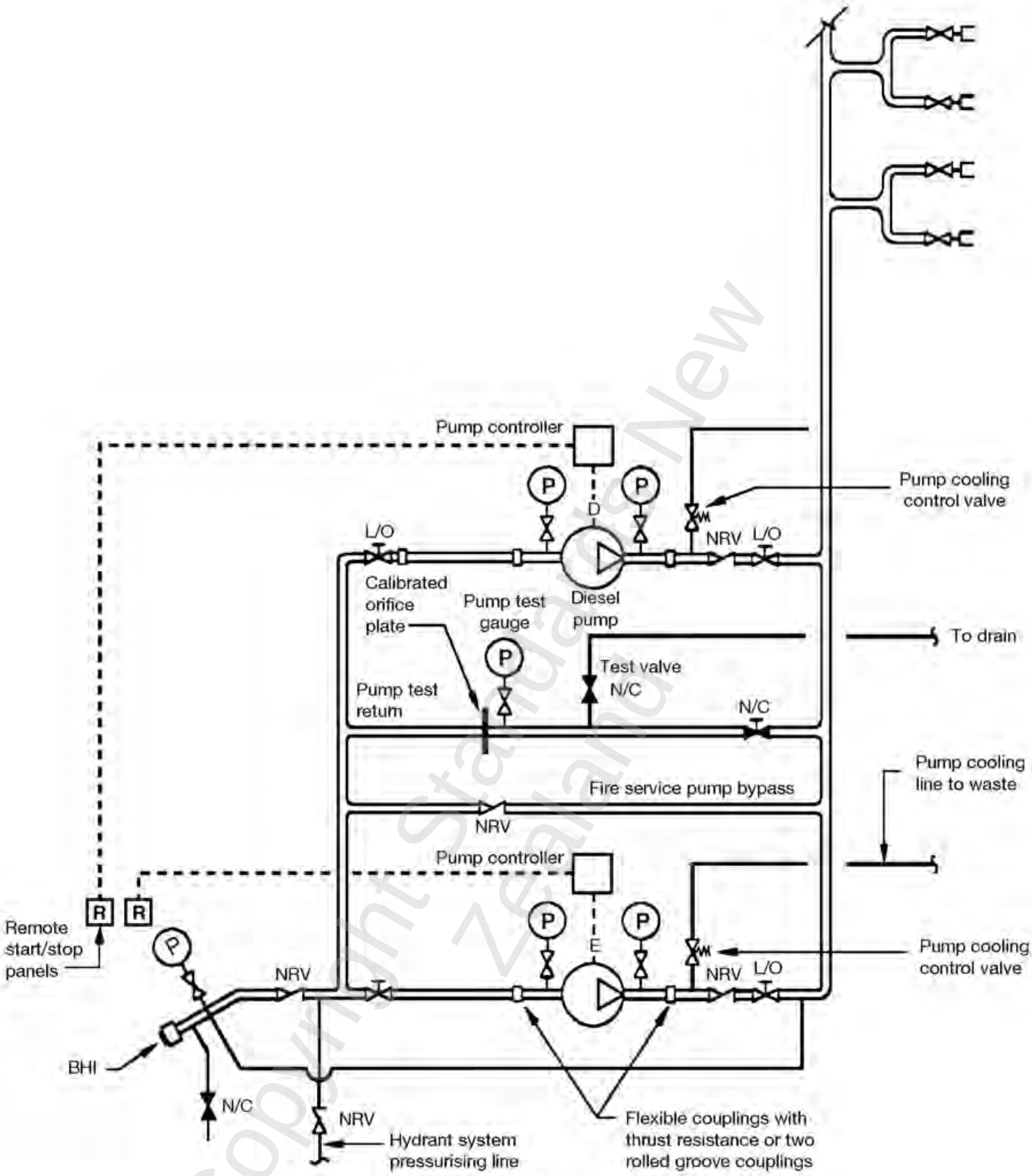
Once started, every pump unit shall run until manually stopped. The use of a failsafe device such as an 'energised to stop' solenoid is acceptable providing it meets the other requirements of this clause.
Automatic stopping is not permitted. A red, clearly labelled, easily accessible stopping device that automatically resets or returns to its normal position shall be provided.

Additionally for electric motors, there shall be a lockable ON/OFF switch to isolate the power supply to the contactor.



NOTE – See 1.4.1 and Appendix E for meaning of abbreviations and graphical symbols.

Figure 13 – Pump unit installation – Arrangement for single booster



NOTE – See 1.4.1 and Appendix E for meaning of abbreviations and graphical symbols.

Figure 14 – Pump unit installation – Arrangement for dual boosters

7.5 PUMP UNIT INSTALLATION

7.5.1 Each pump shall be installed in the waterway according to figure 13 or figure 14.

The following requirements apply:

(a) The pump suction and delivery shall be connected to the fixed piping through flexible couplings to prevent transmission of running vibration and seismic movement and to ensure that the pump alignment is not stressed by the pipes. Any elastomeric type couplings shall be mechanically restrained;

(b) Any valves or fittings which are so constructed that turbulence may be introduced through change in direction or obstruction of the waterway shall be located at least 10 nominal diameters of the suction inlet from the entry to the pump. An uninterrupted length of 10 nominal diameters of pipe, the same diameter as the pump suction, shall be installed immediately upstream of the pump suction flange to effect this requirement;

(c) The suction pipe shall be installed to ensure that air cannot become trapped upstream of the pump suction. When a reducer is required in the pump suction pipework it shall be installed so that no air will be trapped in it, usually necessitating the use of eccentric style reducers.

7.5.2 Each pump shall be kept primed by means of a connection to the suction side of the pump capable of providing the following flows (simultaneously where there is more than one pump) at not less than 20 kPa residual pressure:

(a) Diesel engine driver ……………………………………………………..0.75 L/min/kW

(b) Electric motor driver…………………………………………………...0.25 L/min/kW.

7.5.3 The pump test return around the pump (see figures 13 and 14) shall be taken from the pump delivery (downstream of the flexible coupling) to the pump suction (upstream of the flexible coupling). This pipe shall be fitted with a normally closed, locked, and labelled indicating stop valve fitted with a supervisory device. An orifice plate, sized to induce approximately 110% of the design flow, shall be fitted in the pump test return unless the hydraulic characteristic of the pipework causes 110% of the design flow to be induced. The pump test return valve shall be supervised to signal defect in accordance with 7.6.10 when more than 5% open.

7.5.6 A bypass shall be provided around the pump of the same diameter as the main waterway, and shall be fitted with a non-return valve to prevent recirculation.

7.5.7 Means shall be provided to prevent the temperature of the water in the pump casing rising to more than 35°C during nil or low-flow discharge conditions over a 1-hour period. Acceptable means of achieving this include:

(a) A differential pressure valve;

(b) The diesel motor cooling water supply.

7.5.8 The following gauges shall be provided:

(a) A pressure gauge complete with gauge cock connected to the suction of every pump far enough from the pump not to be influenced by pump entry turbulence;

(b) A pressure gauge complete with gauge cock connected to the pump delivery.

Gauges shall comply with 6.3.

7.5.9 Every pump unit shall be provided with a device which shows at an approved location that the pump is running. On diesel-driven pumps, a HSC may agree to the omission of this alarm if the noise of the engine will serve the same purpose. A self-resetting device may be incorporated to suppress an electrically operated alarm for up to 60 minutes. Where the indication is made at a location which is not staffed at all times, a defect signal shall be generated in accordance with 7.6.10.

7.5.10 A checklist for pump installation is set out in Appendix F.

7.6 PUMP UNIT ENCLOSURE

7.6.1 General

The pump unit shall be installed in a clean dry weathertight enclosure with secure access. When located within a non-sprinkler protected building the enclosure shall have a FRR of 60/60/60. There is no requirement to fire separate the pump enclosure in a sprinkler protected building The enclosure shall be readily accessible to the fire service via signposted doors as required in 2.6.5. If situated below ground the enclosure shall be at least one floor above the lowest floor.

NOTE –

(1) It is recommended that the pump unit enclosure be provided with direct external access.

(2) The intent of this clause is not to require the fire rating of a building containing a hydrant pump that is separated from a protected building by a distance of no less than 10 m.

7.6.2 Protection from hazards

The enclosure shall be situated where it is as free as possible from exposure to fire, explosion, flooding and windstorm damage and, in the case of below ground enclosures, care shall be taken to avoid or deflect run-off stormwater from draining into it.

No liquid or gaseous fuels except those required as a fuel source for fire pump unit prime movers shall be reticulated or stored in the enclosure and a fire extinguisher appropriate to the hazard shall be provided.

7.6.3 Plant rooms

A pump unit may be located in a screened area of a plant room if there is:

(a) No boiler or other explosion hazard;

(b) No uncontrolled dust problem;

(c) No likelihood of water from other services discharging over the pump unit; and

(d) No uncontrolled access by unauthorised persons to the pump unit.

All other requirements for pump unit enclosures shall be met.

7.6.4 Enclosure size

The enclosure shall be of sufficient size to allow free access for testing, maintenance, and removal of all equipment from the enclosure.

7.6.5 Access

Access shall be by a lockable door or hatch sufficiently large and located in such a position as to allow the removal of any individual component of the pump unit without disturbance or damage to other components.

7.6.6 Drainage

The floor shall be graded to drain to a sump which shall be emptied by means of a gravity drain or an automatic sump pump at a flow of at least 50 L/min. The sump shall be at least 600 mm deep and shall have a capacity of at least 0.05 m^3.

7.6.7 Lighting

The enclosure shall be provided with artificial lighting.

7.6.8 Ventilation

There shall be sufficient ventilation to prevent condensation, to provide aspiration for any diesel engines, and to limit the temperature rise to 18°C above ambient under all conditions of pump load for a 1-hour period.

Ventilation and/or louvres shall not be dependent on mains electrical power supply for operation.

Powered ventilation systems using the diesel engine shall be permitted. The requirements of 7.3.5.2 shall be complied with.

7.6.9 Heating

The enclosure shall be provided with a maximum/minimum type thermometer permanently fixed not more than 1.5 m from the floor. A reliable source of artificial heating shall be provided where necessary to maintain the temperature in the enclosure above 5°C at all times.

NOTE – In the case of diesel engines, heating of the engine may also be necessary.

7.6.10 Equipment supervision

Where equipment is required to be supervised in accordance with 7.3.6.1, 7.5.3 and/or 7.5.7, the following shall apply.

If the building is fitted with an automatic fire sprinkler system, a 'defect' signal shall be generated through a fire sprinkler system fire brigade alarm (FBA). The FBA control box used to generate the defect signal shall be clearly marked 'Hydrant pump alarms connected to this unit'.

If the building is not fitted with an automatic fire sprinkler system, a 'defect' signal shall be generated through the fire alarm system fire brigade alarm. The defect signal shall use a fire alarm system circuit or address provided the circuit or address is configured not to generate a fire alarm.

The fire alarm system shall be connected to a remote receiving centre.

8 CONSTRUCTION AND DEMOLITION

8.1 HYDRANT SYSTEM AVAILABILITY

8.1.1 Construction

8.1.1.1
Where building construction includes installation of a permanent building hydrant system, the system shall be installed and brought into commission, progressively as building work proceeds.

8.1.1.2
In multi-storeyed buildings, the system shall be functional, with a building hydrant outlet on every floor, up to a level not lower than 9 m below the highest floor slab.

8.2 PRECAUTIONS DURING INSTALLATION

8.2.1 As each section of the waterway is installed, it shall be immediately capped to prevent entry of foreign material into the pipework.

8.2.2 Once the height of the highest building hydrant outlet above the road surface closest to the hydrant system inlet exceeds 40 m, at least one pump, having the performance characteristics specified in 7.2 shall be connected to the hydrant system. The pump unit may be part of a permanent pumping installation in which case it shall, at the stage that it is required to comply with this subclause, conform with all aspects of section 7 as reasonably practicable.

8.2.3 Where pressure control arrangements are required to conform to 6.2, they shall be progressively installed.

8.2.4 The area around building hydrant outlets shall be kept clear and readily identifiable, both during construction and demolition.

8.2.5 In multi-storeyed buildings, the highest building hydrant outlet shall be provided with a temporary tag, 'HIGHEST FUNCTIONAL OUTLET'.

8.3 TEMPORARY INLETS

8.3.1 During the course of construction, demolition, and building alterations, the building hydrant inlet shall be accessible from the street frontage. This may require installation of a temporary inlet, for example, at the site security fence.

8.3.2 The location of such temporary inlets shall be marked by a 1 metre by 1 metre sign with the words clearly painted in contrasting colour 'BUILDING HYDRANT INLET – KEEP CLEAR'.

8.4 DEMOLITION

8.4.1 In buildings under demolition which are fitted with a building hydrant system, the system shall be maintained in a functional state for as long as possible and should be the last service removed.

8.4.2 Removal shall not occur before the combustible contents of the building have been removed.

8.4.3 In multi-storeyed buildings, the hydrant system shall remain functional on the floor below the highest intact floor.

9 TESTING, MAINTENANCE, AND IMPAIRMENTS

9.1 ACCEPTANCE TESTS AND INSPECTIONS

A building hydrant system shall not be deemed to comply with this Standard unless a Certificate of Compliance has been issued by a hydrant system certifier (HSC).

9.1.1 The following acceptance tests shall be carried out in accordance with this Standard:

(a) The entire system including components, fastenings, supports, and braces to be physically inspected;

(b) A low pressure air test shall be carried out on the system prior to the hydraulic static test;

(c) A hydraulic static test of at least 1-hour duration to 150% of the highest design pressure of each section of piping without leakage;

(d) The design flow rate shall be achieved at the hydraulically most distant points, consistent with the as-built hydraulic calculations;

NOTE – The intention of this clause is for each pressure zone to be flow tested to ensure that the hydraulic requirements are met. This may necessitate simultaneously flow testing adjacent zones.

(e) The correct functioning of all stop valves;

(f) A check of the settings of all pressure reducing valves to confirm conformity with the as-built drawings and hydraulic calculations;

(g) Full inspection of pumpsets including power supplies and equipment. This shall include a 1-hour continuous run of any diesel-driven pumps, with the pump house ventilation provisions in the normal state;

NOTE – All doors to the pump house would be normally closed during the 1-hour run test.

(h) Inspection and check of all required signs;

(i) Inspection and check of the contents of the 'Building hydrant system – Details' manual (see 5.6.3);

(j) Defect alarms.

9.1.2 Flow and pressure measurement associated with acceptance tests shall be by means of certified test gauges.

9.1.3 Prior to final inspection the contractor shall provide to the HSC a copy of the as-built drawings and hydraulic calculations for the system.

9.1.4 Acceptance tests shall be undertaken on:

(a) New systems;

(b) Existing systems required to comply with this Standard which, in the opinion of the HSC, have been substantially altered or extended since original installation.

9.2 ROUTINE TESTS AND INSPECTIONS

9.2.1 Routine tests and inspections set out in 9.2.3 shall be undertaken by a licensed building practitioner (LBP) or an independently qualified person (IQP).

All tests and inspections shall be completed at the specified frequency. A record of all tests and results shall be made in a logbook kept within the premises.

To allow a LBP or IQP to issue a Compliance Certificate in order for a Building Warrant of Fitness to be issued, the LBP/IQP shall be satisfied that the system is performing, and will continue to perform in accordance with the design requirements of the original Standard to which the system was installed. All deficiencies shall be notified to the owner and rectified in a timely manner, taking account of the impact that the deficiency will have on the probability that the system's performance will be compromised.

NOTE –

(1) A Compliance Certificate is commonly referred to as a 'Form 12A' as defined in the Building (Forms) Regulations.

(2) Significant deficiencies which would lead to a significant probability of system failure should be urgently attended to, to ensure that the system will operate reliably. Examples of such deficiencies include a significant deficiency in the water supply such as poor pump performance or pressure control valves causing excessively high or low pressures at the building hydrant outlet(s). A Compliance Certificate should not be issued if such deficiencies exist.

(3) Minor deficiencies which are in the process of being rectified should not preclude the issue of a Compliance Certificate. Such deficiencies could include a minor water supply deficiency, minor pressure reducing valve adjustment, pressure gauges requiring recalibration, and the like. If such deficiencies appear on subsequent inspection reports, a Compliance Certificate should not be issued until such deficiencies are rectified.

(4) An element of judgment may be required in ascertaining if other deficiencies should preclude the issuing of a Compliance Certificate.

9.2.2 If routine tests and inspections disclose conditions which would prevent the correct functioning of the hydrant system, a rectangle of a minimum of 150 mm sides, coloured buff, with the word 'DEFECT' in black on one side and details of the defect and date of inspection on the reverse, shall be displayed in the building hydrant inlet enclosure for as long as the condition remains.

9.2.3 The following tests and procedures shall be carried out at the specified intervals (see Appendix G for a suitable checklist):

(a) Monthly – each diesel pumping unit shall be checked for correct start, run (no less than 5 seconds) and stop functions;

NOTE – It is strongly recommended that all fluid levels are checked before start-up.

(b) Quarterly –

(i) Each diesel pumping unit shall be exercised under load for a period of at least 15 minutes and shall be checked for correct start, run and stop functions, pressure characteristics, and for battery acid density, age, external cleanliness, belt tightness, filter state, fuel, oil and water levels

(ii) Electric motor driven pumps shall be exercised under load for a period of at least 5 minutes and shall be checked for correct start, run and stop functions, and pressure characteristics

(iii) The correct position of valves associated with the pump shall be checked;

(c) Annually –

(i) All parts of the system and components shall be visually inspected for defects and for compliance with this Standard. Such inspection shall take into account building changes or other issues external to the system which relate to compliance

(ii) Exercise all hydrant outlet valves to the full open and closed positions to ensure correct operation

(iii) The waterway shall be hydrostatically tested to a pressure not less than the maximum working pressure, that is N_c plus the maximum pressure from the pump curve

(iv) On systems with pressure reducing valves controlling zones, a flow test of the system over the range of a single hose stream flow as specified in 3.3 to the design flow through the full length of each main waterway and through each pressure reducing valve controlling a zone. The correct operation of each pressure reducing valve shall be checked

(v) Every diesel engine forming part of a diesel-driven pump unit shall be serviced by the engine manufacturer's agent every year, the oil changed, and a check made of the air filter, the coolant for corrosion, and the fuel for bacterial sludging.

Additionally, every second year, the service shall include changing the oil filters, fuel filters, belts, and thermostats. This service shall be followed by a full load run of the pump unit for at least 2 hours

(vi) Any pumpset flexible couplings that rely on elastomeric elements for transmission of drive shall be inspected for obvious wear and deterioration. If any evidence of wear or deterioration is evident, the coupling's elastomeric element shall be replaced;

(d) Biennially – Each battery of each diesel-driven pumpset shall be routinely replaced every four years except that one of the batteries shall be initially replaced after two years so that, from then on, one battery is replaced every two years;

NOTE – In this context 'battery' means a set of cells connected to a single charger.

(e) 5-yearly –

(i) For systems without pressure-reducing valve controlled zones, a flow test of the system over the range of a single hose stream flow as specified in 3.3 to the design flow through the full length of each main waterway

(ii) Any building hydrant pump unit shall be tested for operation, flow, and pressure characteristics compared with performance at the time of initial installation and the manufacturer's data sheets

NOTE – Comparison with original characteristics will not necessarily identify the need for remedial action but could forecast the need for future remedial work.

(i) Pumpset flexible couplings, which rely on the integrity of the elastomeric element shall have the element replaced

(ii) The elastomeric elements of all pilot-operated pressure reducing valves shall be replaced. The pilot valves shall be disassembled, cleaned, and any maintenance necessary through either inspection or manufacturer's recommendations shall be carried out. The valves shall be flow tested after reassembly to ensure that the desired control function is provided. All check valves shall be inspected and tested and any elastomeric seals and seats replaced.

9.3 MAINTENANCE

9.3.1 Building hydrant systems shall be maintained at all times in correct working order.

9.3.2 During any routine or other inspection, if there is any indication that the building hydrant inlet assembly has been tampered with, such as unlocked enclosures, or physical damage to enclosure doors, a visual inspection of the building hydrant inlet shall be carried out to ensure that no foreign debris has been lodged inside the pipework system. This may necessitate a partial dismantling of this assembly.

9.4 BUILDING ALTERATIONS

9.4.1 Appropriate alterations shall be made to the building hydrant systems in cases where building alterations affecting the location of building hydrant outlets, signage, the setting of pressure control devices, or other matters result in the hydrant system no longer conforming to this Standard.

9.4.2 During the course of building alterations, building hydrant systems shall remain operational where reasonably practicable.

9.4.3 Prior to any alterations to the hydrant system, confirmation shall be gained from the building consent authority whether a building consent is required. This provision is not required for routine maintenance.

9.5 PRECAUTIONS TO BE TAKEN WHEN AN INSTALLATION IS RENDERED INOPERATIVE

9.5.1 General

Building hydrant systems may be rendered inoperative from time to time to effect maintenance, repairs or alterations. The contractor shall follow the procedures and take the precautions specified in this section and any others required by the fire service or hydrant system certifier (HSC).

9.5.2 Notification

9.5.2.1

Before a building hydrant system is rendered inoperative, notification in writing shall be delivered to the building owner or their agent or representative and the fire service 24 hours in advance of the work commencing. The building owner shall be advised to inform their insurers of any isolation.

NOTE – See 9.4 for works requiring building consent.

If an emergency compels immediate action to render the system inoperative, such notifications shall be given as soon as possible afterwards.

9.5.2.2

Notification to the building owner or their agent or representative shall include the following information:

(a) Name and address of premises;
(b) Reason for rendering system inoperative;
(c) Date and time system will be off;
(d) Details of extension or alteration work;

(e) Whether ‘frying pans’ or sectional valves will be used to isolate a section or zone of a system;

(f) Whether the work will involve cutting or welding and, if so, the precautions that will be taken.

Notification to the fire service shall include items (a) to (e).

The building owner shall be advised to inform their insurers of items (a) to (f).

NOTE –

(1) Information may be provided in the form shown in figure H1.

(2) Hot work should be avoided if there are any other practicable alternatives.

9.5.2.3

A tag label as shown in figure 15 or similar shall be used to identify sections of a building hydrant system left isolated.

Part A

Impairment Notice number:

Date: _____/ ______/ _______

Contractor: ______________________

Work Permit Number: ____________

Fire Hydrant System Number __________
Isolated:

Part B

Section of fire hydrant system isolated:
(Give location of isolated valve or blanking plate used and area of building not covered)

____
____
____
____

Date of isolation: ____/ _____/ _______

Proposed date of reinstatement:
____/ _____/ ____

Contractor: ______________________

Signed: __________________________

Owner: __________________________

Signed: __________________________

Figure 15 – Typical form for isolation tag card

This tag shall be affixed in a location where it is likely to be found by the contractor’s service personnel. A possible location could be the building warrant of fitness book or attached to the main fire alarm panel.

Part A shall be completed whenever a hydrant system is isolated and left unattended.

When a section or zone of a hydrant system is isolated Part B shall be completed by the contractor and the isolation card affixed as shown in figure 15. The card shall remain affixed until the whole system is restored.

In addition to the above, an A4 sized laminated notice shall be attached to the building hydrant system inlet to notify the New Zealand Fire Service personnel that the system is not operational. This notice shall be labelled in 50 mm high letters 'BUILDING FIRE HYDRANT SYSTEM NOT OPERATIONAL'.

9.5.2.4

No building hydrant system or building hydrant water supply shall be altered or rendered permanently disabled without a building consent for the work being issued by the territorial authority or BCA and the fire service and HSC informed.

9.5.3 Authorisation

Except in an emergency, the system shall not be rendered inoperative until the owner or their authorised representative has authorised the work by signing Part B of the form set out in figure 15.

APPENDIX A – SYSTEMS INSTALLED TO SUPERSEDED STANDARDS

(Informative)

For extensions to existing systems where building hydrant outlet couplings are single-lugged, the permissible pressure range shall be 600 kPa to 1050 kPa.

A1 Existing riser systems have been installed to superseded Standards, which may include the following:

(a) NZS 4510:1998 Fire hydrant systems in buildings;
(b) NZS 4510:1978 Riser mains for fire service use;
(c) The 1990 Interim Code of Practice for Charged Riser Compliance issued by the Commander Region 1, New Zealand Fire Service;
(d) Other specifications or Standards.

A2 It is recommended that existing riser systems, other than those complying with NZS 4510:1998, be upgraded to meet the relevant criteria of this Standard specified in either (a) or (b) below as appropriate:

(a) Hydrant systems designated as 'Dry Risers' which:
- (i) Are charged with water and comply with 3.5
- (ii) Are provided with booster pumps as required by 3.4, and conform to section 7
- (iii) Have pressure control devices, where required, installed to conform with section 6 to ensure pressures at building hydrant outlets are within the limits specified in 6.2
- (iv) Incorporate in the riser inlet assembly, a pressure gauge to conform to 5.4.2 and 6.3
- (v) In areas having a seismic factor greater than 0.13, as defined in NZS 1170 Part 5, either conform to 2.4 or in the opinion of a design engineer, are capable of remaining functional at the earthquake loadings specified in NZS 1170 Part 5
- (vi) Have the building hydrant inlet enclosure labelled in conformance with 2.6
- (vii) Have fire service reference documents provided in conformance with 5.6;

(b) Hydrant systems designated as 'Wet Risers' which:
- (i) Are provided with one or more booster pumps capable of developing the pressure required at each building hydrant outlet as specified in section 3 when flowing either:
  - (A) The number of simultaneous hose streams required in 3.3 at the design flow rate specified at 3.2, or
  - (B) At a flow calculated as 1200 L/min multiplied by the largest number of building hydrant outlets on any one floor whichever is the lesser flow
- (ii) Have pressure control devices, where required, installed to conform to section 6 to ensure pressures at building hydrant outlets are within the limits specified in 6.2
- (iii) Have each booster pump unit found on inspection, and to the satisfaction of the HSC, to be in good working order
- (iv) Incorporate in the riser inlet assembly, a pressure gauge to conform to 5.4.2 and 6.3.

(v) In areas having a seismic factor greater than 0.13, as defined in NZS 1170 Part 5, either conform to 2.4 or in the opinion of a design engineer is capable of remaining functional at the earthquake loadings specified in NZS 1170 Part 5.

(vi) Have the building hydrant inlet enclosure labelled in accordance with 2.6.

(vii) Have fire service reference documents provided in accordance with 5.6.

A3 In the event that an existing system requires substantial extension or alteration as a consequence of building alterations, the territorial authority may require the system to be suitably altered for new systems to comply with the requirements of this Standard. In such cases, it shall be a permitted exception, subject to the agreement of the territorial authority, to reuse components of the original system which remain in good order.

A4 It is recommended that systems installed to any previous Standards are tested against this Standard as reasonably practicable. Where this is not practicable the testing requirements of the Standard to which the system was installed should be referenced.

A5 It is recommended that any existing building hydrant outlets with single-lugged connections be replaced with double-lugged connections. In such cases the use of double building hydrant outlets controlled by ball valves is encouraged.

APPENDIX B – SIGNS
(Informative)

B1 INTRODUCTION

This Appendix sets out the signage requirements that should be followed in applying this Standard.

B2 LETTERING TYPE AND PROPORTIONING OF SIGNS

Lettering type and proportioning of signs should be as follows:

(a) Vertical block type lettering using full strokes should be used.

(b) The letter proportions are as set out in table B1 and figure B1.

(c) The thickness of the letter (d) may vary between 15% and 30% of the height of the letter (h).

NOTE –

(1) Acceptable typesets complying with the above paragraph are Helvetica and Univers.

(2) Helvetica bold d=0.3h and Helvetica condensed d=0.15h.

Table B1 – Proportion of lettering

Dimensions	**Ratio**	**Examples of dimensions** (mm)							
h	(10/10) h	10	20	25	40	50	75	100	125
c	(7/10) h	7	14	17.5	29	35	52.5	70	87.5
a	(2/10) h	2	4	5	9	10	15	20	25
b	(14/10) h	14	28	35	56	70	105	140	175
e	(6/10) h	6	12	15	24	30	45	60	75

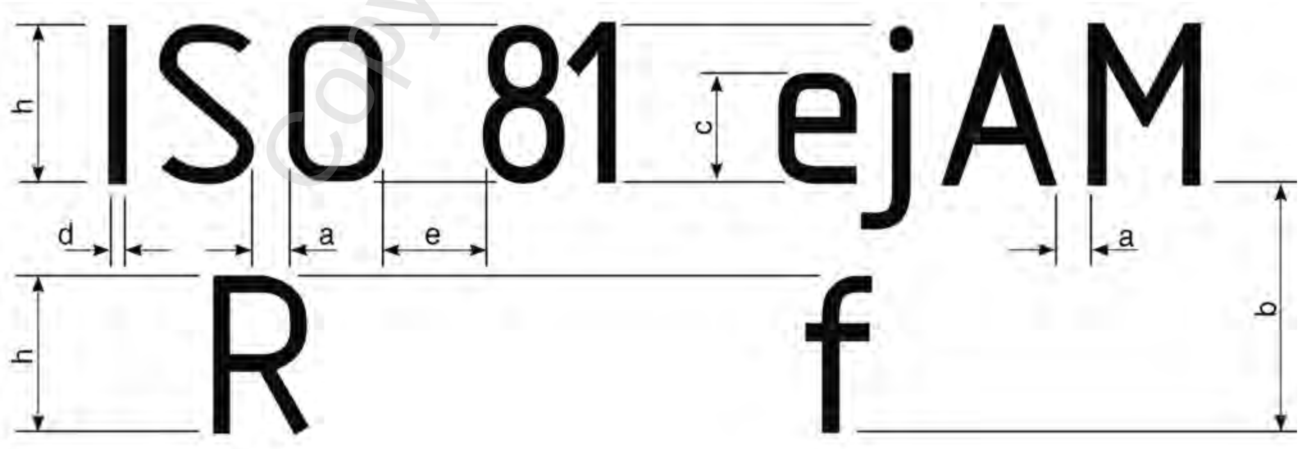


Figure B1 – Proportion of lettering

B3 SAFETY COLOURS

The colours for safety signs should comply with table B2.

Table B2 – Safety colours

Safety colour	Specification	
	Reference Standard	**Colour number**
Safety Red	BS 5252	04E53
Safety Yellow	BS 5252	08E51
Safety Green	BS 5252	14E53

B4 USE OF STAIRS BY FIRE SERVICE PERSONNEL

Stairs used by fire service personnel should be provided with signs to identify the floor level. This sign should be clearly visible from each floor level landing.

Where building hydrants are located in spaces containing a stairwell, stair doors which give access to those hydrants should be identified. This requirement only applies to those doors located on floors to which fire service personnel have direct access from the street and where one or more stairs leads away from these floors. An acceptable sign is shown in Acceptable Solution F8/AS1, of the Compliance Document for NZBC Clause F8.

Where building hydrants are located in spaces using scissor stairs the stairwell door at each level providing direct access from the street for fire service personnel should display a sign indicating the floor level location of hydrants which can be accessed from that particular door. An acceptable sign is shown in Acceptable Solution F8/AS1, of the Compliance Document for NZBC Clause F8.

Signs should comply with the requirements of Appendix B and have lettering no less than 25 mm in height. Signs required to identify the location of hydrants on stairwells should comprise white lettering on a red background.

APPENDIX C – LOW-RISE BUILDINGS

(Informative)

C1 INTRODUCTION

This informative Appendix has been introduced to provide guidelines for the provision of hydrants to protect low-rise buildings such as warehouses and shopping malls. Unlike high-rise buildings, which contain fire rated stairwells, these buildings typically lack a safe location for the fire service to establish a firefighting attack. For low-rise buildings the preferred approach is the use of a system of external building hydrant outlets located close to entry points to the building which provide an equivalent function. These building hydrant outlets are intended for use for interior firefighting (building fire protection system), and are part of a building hydrant system and are distinct from street hydrants as may be required under SNZ PAS 4509.

These systems should incorporate building hydrant outlet assemblies, pipework, hydrant inlet assemblies, water charging arrangements, maintenance, testing and so on, in accordance with the mandatory requirements of this Standard.

NOTE – A system of external hydrants is exactly the same as a building hydrant system in that the fire service is required to supply the necessary flow and pressure into the building hydrant system inlet.

C2 LOCATION OF EXTERNAL BUILDING HYDRANTS

External building hydrants should be located as follows:

(a) In a position that provides pedestrian access to the building for the fire brigade. Any doors should be designed to allow the fire service to enter the building during a fire emergency;

(b) So that all parts of the building are within a 60 m arc from the building hydrant outlet where the hydrant is located no more than 3 m from the point of entry to the building (see figure C1); or

(c) Where the hydrant is located more than 3 m from the point of entry to the building the hose length between the hydrant and the door should be allowed for. This distance is to be subtracted from the allowed 60 m arc length, and this reduced arc distance is to be used to calculate coverage from the point of entry to the building;

(d) If parts of the building (including canopies) are unable to be covered by 60 m arcs of the external hydrants, additional internal hydrants meeting the requirements of 4.1 may be located inside the building (and under canopies). Additional hydrants should be located in accordance with the following:

  (i) If the building is not sprinkler protected the internal hydrants should be located within the 60 m arc from the external hydrants (see figure C2), or

  (ii) If the building is sprinkler protected internal hydrants should be located so that all parts of the building are reached by the overlapping arcs formed by the 60 m arc from the external hydrant and the 40 m arcs of the internal hydrants (see figure C3);

(e) Building hydrant outlets should be located:

(i) In a position not less than 10 m from any high voltage main electrical distribution equipment such as transformers and distribution boards, and from liquefied petroleum gas and other combustible storage

(ii) In a position so that the building hydrant is not obstructed or obscured by obstacles, stored goods, vehicles, vegetation, and so on

(iii) In a position so that any above-ground hydrant is protected from possible mechanical damage by vehicles;

(f) Signs 600 mm x 300 mm should be located adjacent to all external building hydrant outlet assemblies which state 'BUILDING HYDRANT OUTLET' in 50 mm high contrasting letters.

NOTE – The use of 60 m arcs from an external hydrant allows for three lengths of hose to be used, as opposed to a 40 m arc from an internal hydrant allowing two lengths of hose.

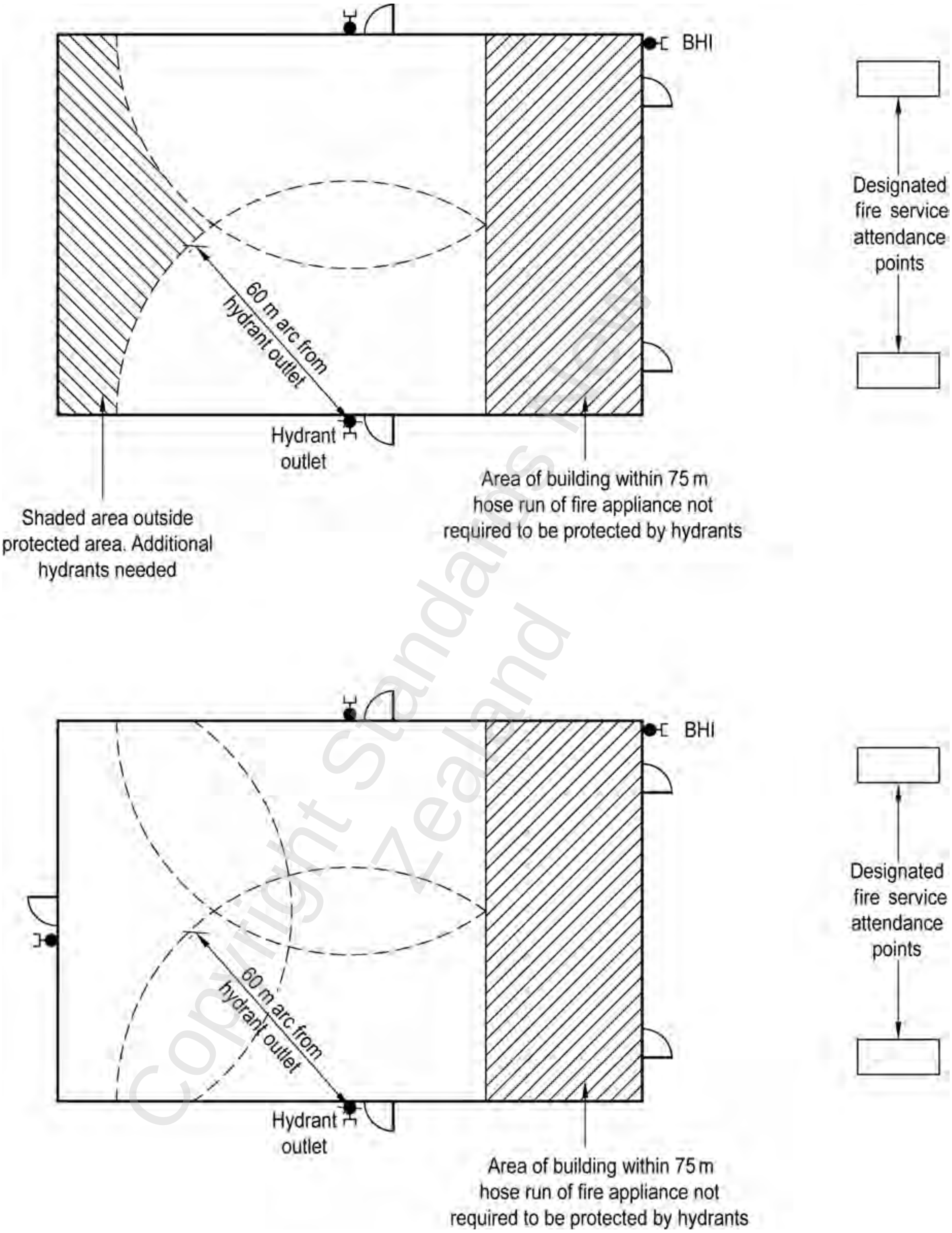


Figure C1 – Additional external hydrant outlets and access

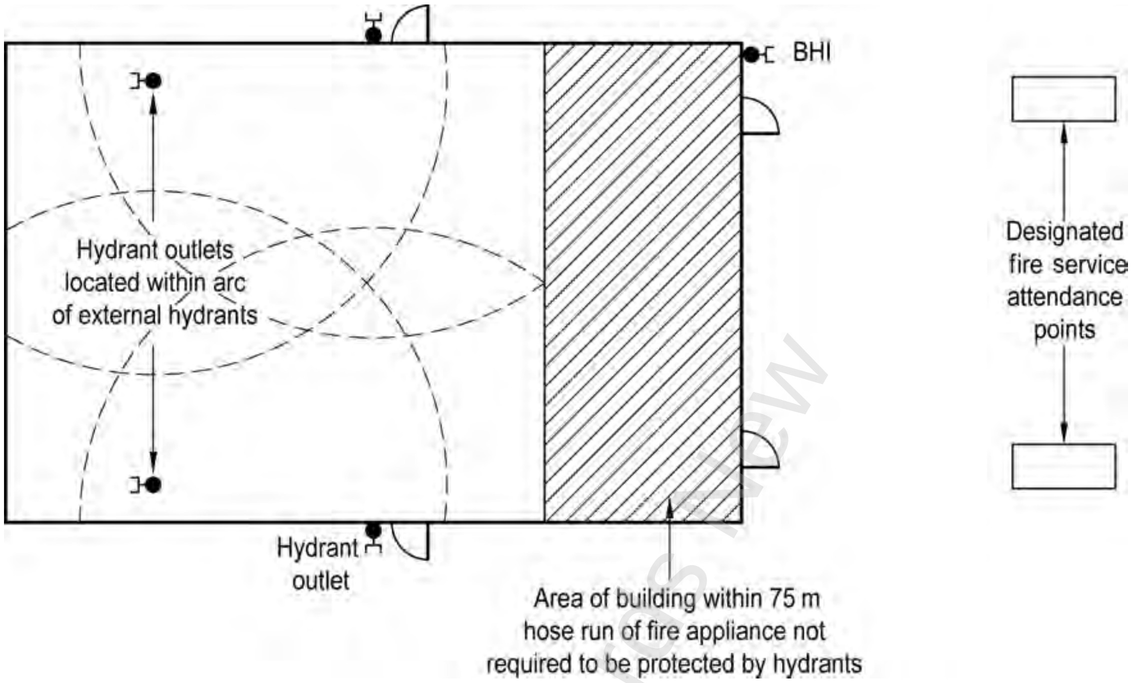


Figure C2 – Internal hydrants no sprinkler protection

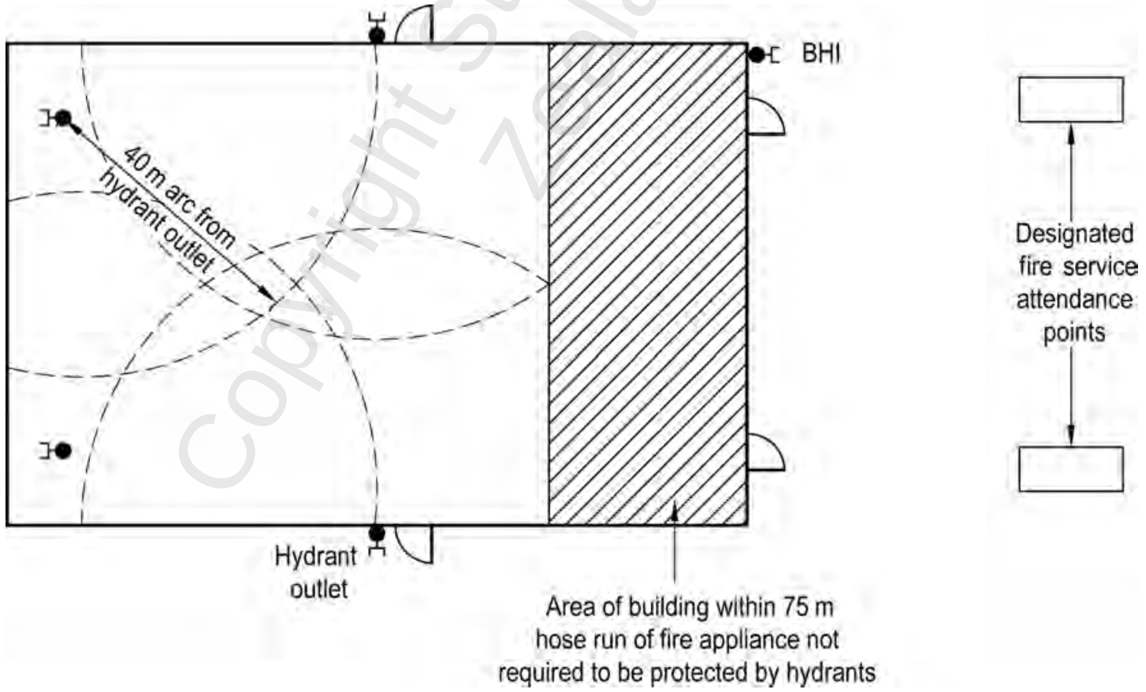


Figure C3 – Sprinkler protection hydrant outlets may be located outside arcs of external hydrants

C3 FLOW AND PRESSURE FROM EXTERNAL HYDRANTS

External hydrants should provide a minimum building hydrant outlet pressure of 900 kPa. Internal hydrants forming part of the hydrant protection for a low-rise building should provide a minimum building hydrant outlet pressure of 600 kPa.

NOTE – There are two reasons for differences in building hydrant outlet pressures specified for internal and external hydrants. The first relates to differences in branches used for external fire hose streams, and the branches used in hydrant riser packs. The second difference is that internal hydrant riser packs are supplied with two lengths of hose, while it is assumed that three lengths can be used at external hydrants.

C3.1 Minimum flow rates for hose streams

The required minimum flow rate for each hose stream in operation should be as set out in table C1.

Table C1 – Minimum flow rates for hose streams

Sprinklered buildings	Unsprinklered buildings
500 L/min (3 outlets)	440 L/min (4 or more outlets)

C3.2 Simultaneous hose streams

The number of simultaneous hose streams operating should be:

(a) If the building is sprinkler protected three building hydrant outlets flowing 500 L/min each; or

(b) If the building is not sprinkler protected the number of simultaneous hose streams operating should be determined by the water requirements from SNZ PAS 4509. Up to a maximum of 12 hose streams flowing 440 L/min should be required.

C4 PROTECTION OF EXTERNAL HYDRANTS

Building hydrant outlets on the outside of buildings should be protected either:

(a) By construction:
   (i) Having a FRR of the lesser of 60 minutes or the value derived from the calculated S rating for the exposed firecell
   (ii) Extending 2 m each side of the building hydrant outlet, and
   (iii) Extending not less than 3 m above the ground adjacent to the building hydrant or the height of the building, whichever is the lesser;

OR

(b) By a minimum 10 m horizontal separation distance between the nearest unrated portion of the building (including the canopy edge) and the hydrant position.

NOTES

APPENDIX D – MATTERS DECLARED BY NEW ZEALAND FIRE SERVICE NATIONAL COMMANDER

(Normative)

D1 For the purposes of determining the maximum pressure (P_{NC}) assumed to be available at the outlet of any fire service pumping appliance, the value shall be that declared from time to time by notice in the New Zealand Fire Service Gazette by the National Commander.

D2 In declaring such values, the National Commander shall take into account the characteristics of fire service equipment and all other specific requirements of this Standard.

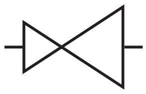
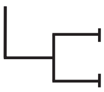
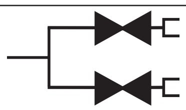
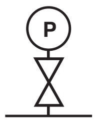
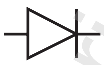
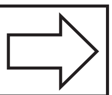
D3 The National Commander may declare such fire service standard operating procedures for the use of hydrant systems as are necessary and require consideration in the application of this Standard. To the extent that this Standard provides for such consideration the National Commander's declaration shall be binding and form part of this Standard.

NOTES

APPENDIX E –
DRAWING CONVENTIONS FOR USE IN HYDRANT SYSTEM DIAGRAMS

(Informative)

E1 The following graphical symbols should be used for fire protection drawings and are based on SA HB 20.

No	SYMBOL	MEANING
1		Stop valve – normally open (general symbol)
2		Stop valve – normally closed (general symbol)
3		Pressure reducing valve
5	 BHI	Building hydrant inlet
6		Building hydrant outlet
7		Pressure gauge and isolating valve
8		Direction of flow
9		Non-return valve or back flow prevention unit (direction of flow)
10		Pump (general symbol)(D = Diesel)(E = Electric)
11	R	Remote start/stop panel
12	Flow (L/Min) Pressure (kPa) Design .... No flow	Shut off and design flow/pressure for pumps
13	PUMP ACCESS 	Entry point for access to pumps

NOTES

APPENDIX F – CHECKLIST FOR PUMP INSTALLATIONS

(Informative)

Record details against each item in the checklist.

Site ....

Address ....

....

Installer ....

PUMP ENCLOSURE

	YES	NO
Fire rated not less than the building	☐	☐
Security & access adequate	☐	☐
Not on lowest level below ground level	☐	☐
Signage from fire service entry point	☐	☐
Lighting adequate	☐	☐
Drainage adequate	☐	☐
Heating adequate	☐	☐
Ventilation adequate	☐	☐
Low temperature alarm fitted	☐	☐
Max./min. thermometer fitted	☐	☐
Fire extinguisher installed & service tagged	☐	☐
Backflow prevention device fitted and tested annually	☐	☐

DIESEL PUMP UNIT

Functional data

Motor make ....

Model ....

Kw ....

Pump make ....

Model ....

Impellor size ....

Duty flow & pressure ....

Duty speed @ duty flow ....

Actual speed @ duty flow ....

Pump suction @ duty flow ....

Pump delivery @ duty flow ....

Pump suction – test return valve open ....

Pump delivery – test return valve open ....

Pump

	YES	NO
Pump suction – 10 diameters straight pipe	☐	☐
Pump suction – primed	☐	☐
Pump suction – no air entrainment/eccentric reducer	☐	☐
Pump suction & delivery flexible couplings installed	☐	☐
Pump bypass fitted with non-return valve	☐	☐
Pump case cooling fitted	☐	☐
Test return fitted & sized correctly	☐	☐
Orifice plate k factor	☐	☐
Test return valve locked	☐	☐
Test return valve labelled	☐	☐
Test return valve indicator fitted	☐	☐
Test return valve supervised	☐	☐
Pressure relief valve fitted & operational	☐	☐
Suction gauge fitted	☐	☐
Delivery gauge fitted	☐	☐
Gauge isolation valves fitted	☐	☐

Motor

	YES	NO
Pump unit bolted down & vibration pads fitted	☐	☐
Pump coupling alignment correct	☐	☐
Pump coupling guarded	☐	☐
Batteries covered	☐	☐
Batteries labelled A or B	☐	☐
Batteries dated	☐	☐
Batteries crank 60 seconds each	☐	☐
Cooling water valve strapped open	☐	☐
Cooling water valve labelled	☐	☐
Cooling water bypass valve strapped closed	☐	☐
Cooling water bypass valve labelled	☐	☐

Cooling water indicator fitted & strainer clear	☐	☐
Fuel tank capacity adequate	☐	☐
Fuel tank height correct	☐	☐
Fuel gauge fitted & tank over ¾ full	☐	☐
Fuel tank pipes & fittings non-galvanised & graded correctly	☐	☐
Fuel tank filling & venting correct	☐	☐
Secondary fuel containment provided	☐	☐
Fuel line isolation valve fitted & locked	☐	☐
Fuel line agglomerator fitted	☐	☐
Fuel line protected	☐	☐
Fuel line metal armoured flexible at engine	☐	☐
Manometer plug/condensate drain fitted	☐	☐
Exhaust flexible fitted	☐	☐
Exhaust silencer fitted	☐	☐
Exhaust pipe guarded	☐	☐
Exhaust pipe clearances adequate	☐	☐
Exhaust outlet protected from ingress	☐	☐
Stop level labelled	☐	☐
Stop lever coloured red	☐	☐
Stop lever auto returning	☐	☐
Emergency start device fitted & operational	☐	☐
Emergency start device labelled & strapped	☐	☐
Oil drip tray provided & adequate size	☐	☐

Controller

	YES	NO
Manufacturer's handbooks & circuit diagrams provided	☐	☐
Logbook provided	☐	☐
Pump unit maintenance contractor details provided	☐	☐
Instruments & indicators operative & labelled	☐	☐
Tachometer operative & accurate	☐	☐
Manual start button operative & labelled	☐	☐
Pump running indication fitted	☐	☐
Data plate fitted & details correct	☐	☐
Electrical connector to motor secure & supervised	☐	☐
Battery charger power supply labelled	☐	☐

ELECTRIC PUMP UNIT

Functional data

Motor make ....

Model ....

Kw ....

Pump make ....

Model ....

Impellor size ....

Duty flow & pressure ....

Duty speed @ duty flow ....

Actual speed @ duty flow ....

Pump suction @ duty flow ....

Pump delivery @ duty flow ....

Pump suction – test return valve open ....

Pump delivery – test return valve open ....

Pump

	YES	NO
Pump suction – 10 diameters straight pipe	☐	☐
Pump suction – primed	☐	☐
Pump suction – no air entrainment/eccentric reducer	☐	☐
Pump suction & delivery flexible couplings installed	☐	☐
Pump bypass fitted with non-return valve	☐	☐
Pump case cooling fitted	☐	☐
Test return fitted & sized correctly	☐	☐
Orifice plate k factor	☐	☐
Test return valve locked........................	☐	☐
Test return valve labelled	☐	☐
Test return valve indicator fitted	☐	☐
Test return valve supervised	☐	☐
Pressure relief valve fitted & operational	☐	☐
Suction gauge fitted	☐	☐
Delivery gauge fitted	☐	☐
Gauge isolation valves fitted	☐	☐

Motor

	YES	NO
Motor more than 150 mm above floor	☐	☐
Pump unit bolted down & vibration pads fitted	☐	☐
Pump coupling alignment correct........................	☐	☐
Pump coupling guarded	☐	☐

	YES	NO
Rotation correct	☐	☐
Five successive starts at 20 second intervals	☐	☐

Controller

	YES	NO
More than 450 mm above floor	☐	☐
Manual stop & start buttons fitted & labelled	☐	☐
Power supply supervisory equipment fitted & operational	☐	☐
Pump malfunction alarm fitted & operational	☐	☐
Pump running indication fitted	☐	☐
Independent power supply	☐	☐
Power supply protected	☐	☐
Power supply isolators labelled	☐	☐
Data plate fitted & details correct	☐	☐

BHI ENCLOSURE EQUIPMENT

	YES	NO
Manual start button(s) fitted & labelled	☐	☐
Pump running lamp installed & operational	☐	☐
Above equipment installed in IP 65 enclosure (as per AS 60529)	☐	☐
Cable to BHI enclosure fire rated & protected	☐	☐
Charge feeders before starting pump sign	☐	☐
Pressure gauge fitted	☐	☐
Pressure gauge labelled	☐	☐
Fire service reference documents provided	☐	☐

Inspected by ....

Company ....

Name ....

Signed ....

Date ....

NOTES

APPENDIX G – ANNUAL INSPECTION CHECKLIST AND MAINTENANCE SCHEDULE FOR DIESEL ENGINES

(Informative)

Tick as each test item is checked and record test results.

1. Check ease of starting from both remote and local panels ☐

2. Run engine on load for 15 minutes and check pump bearings and engine for any overheating ☐

3. Check cooling system for loss of coolant ☐

4. Check for the free movement of all moving parts, including controls, governor equipment etc. ☐

5. Check for knocks and other audible signs of wear or maladjustment ☐

6. Stop engine ☐

7. Drain engine oil and refill crankcase with manufacturer's recommended grade of oil ☐

8. Clean electrical apparatus and check that battery charge rate is correct: ☐

   Charge voltage (no load) ....
   Charge current ....

9. Check that the battery paralleling apparatus operates correctly ☐

10. Check starter commutators and if necessary clean with cloth
    Check length of brushes and ensure free movement in holders ☐

11. Ensure all electric wiring to batteries and remote and local control panels and so on is in good order ☐

12. Check the voltage of each battery with a load tester and record: ☐

    Battery A .... volts. Installed date ....
    Battery B .... volts. Installed date ....

13. Clean fuel sludge sump, check fuel tank breather, filler cap, and gauge ☐

14. Check condition of all fuel lines ☐

15. Visually check fuel pump and injectors. Replace any doubtful parts ☐

16. Ensure all belts are correctly adjusted. Replace every two years or if badly worn or cracked.
    Date drive belt last replaced .... ☐

17. Drain, flush, and refill engine cooling system with water and inhibitor ☐

18. Replace thermostat every two years. Date last replaced .... ☐

19. Check condition of cooling system hoses and tightness of connectors ☐

20. Check and adjust tappet clearances ☐

21. Check around oil sump and remedy any leaks ☐

22. Lubricate all parts such as control rods, bearings, linkages and so on ☐

23. Clean or renew all oil filters, air filters, and fuel filters ☐

24. Check condition of all lubricating oil pipelines. Replenish all grease cups with correct grade of grease ☐

25. Check the compression of each cylinder every two years and record pressure or date last done: Date last checked .... ☐

Cyl no.	1	2	3	4	5	6	7	8
Pressure								

26. Drain pump bearings and refill with oil or grease of the correct grade as appropriate ☐

27. Examine any pump glands and if necessary repack with correct type and quantity of packing. Check mechanical seals ☐

28. On completion of the above checks carry out a full monthly check (see 9.2.3(a)) and run on full load for at least two hours ☐

29. Check that neither battery has been in service longer than four years and that installation dates are clearly marked ☐

I have carried out a thorough inspection of the engine, including all the above checks and instructions. I consider that (subsequent to the maintenance outlined below)* the engine is*/will be* in good running order.

* Delete where not applicable

Name ……………………………………………..

Signed .... Certified A-grade diesel engine mechanic

of ....(Company)

Date ....

APPENDIX H – SAMPLE NOTIFICATION FORMS

(Informative)

H1 FAX BACK FORM

When notifying the building owner or their agent or representative that a building hydrant system is to be rendered inoperative, information may be provided in the form shown in figure H1.

Fax Back Form From:

Date: ____________________

Building name: ____________________

Contractor: ____________________

Contractor telephone contact details: ____________________

To:

Customer: ____________________

Attention: ____________________ No / Pages: ____________________

Ph. Number: ____________________ Fax Number: ____________________

FIRE PROTECTION SYSTEM SHUTDOWN

INSTRUCTIONS:

- 24 hours notification of all programmed isolations shall be given in writing to the Fire Service and the Building Owner prior to a hydrant system being rendered inoperative.
- If an emergency compels immediate action to render a system inoperative, such notification shall be given as soon as possible afterwards.
- NZS 4541 & 4515 (sprinkler systems), NZS 4512 (fire alarm systems), NZS4510 (fire hydrants), NZS4503 (hose reels), require Sections A and B to be completed and sent to the New Zealand Fire Service or their agents prior to a fire hydrant shutdown. Section B requires 'OWNERS APPROVAL' and for the Owners to notify their insurers if the systems are isolated for more then 12 hours.

NOTE –

(1) Partially isolated systems – If a section or zone of a fire hydrant system is isolated, blanked off or left impaired while the main system is restored a tag label shall be attached to the main stop valve showing which sections are affected. Building owners must inform NZFS, and their insurers that the system has been partially restored and must inform the fire service, and their insurers when the isolated sections have been restored.

(2) Send completed forms and notifications to the New Zealand Fire Service by email: fireinfo@fire.org.nz or by fax: 09 309 8223. For more information phone 0800 FIREINFO (0800 347 346).

'OWNERS' Please **'sign'** your approval of this shutdown in **Section B** of this form and fax to your insurer/broker/agent.

NZFS fax: ____________ Date: __/__/__ Building owner's insurance fax: ____________ Date: __/__/__

Section A Fire System / Site Detail

SYSTEM

PFA No: ____________________

Building name: ____________________

Address: ____________________

Fire system: Sprinkler 4541 ☐ Sprinkler pumps ☐ Sprinkler 4515 ☐ Fire alarm 4512 ☐ Hydrants 4510 ☐ Hose reels 4503 ☐

Areas Affected: ____________________

SHUTDOWN

Shutdown date: ____________ Shutdown time: ____________ Reinstated daily: ____________

Reinstatement date: ____________ Reinstatement time: ____________ Continuous shutdown: ____________

SECTION OF SYSTEM LEFT ISOLATED WHILE MAIN SYSTEM RESTORED

Date due for completion: ____________ Date completed: ____________

Work to be completed during system shutdown: Alterations: ☐ Damage to system: ☐ Maintenance work: ☐

Other: ____________________

Owner's Actions

Please use this form to notify your **'building insurers'** of all shutdowns, reinstatements and of any sections of a system left isolated.

NOTE – If a section or zone of a fire hydrant system is isolated, blanked off or left impaired while the main system is restored a tag label must be attached to the main stop valve indicating which sections are affected.

Section B Owner's Approval

Date: ____________ Name: ____________________ Insurers notified: Yes ☐ No ☐

Time: ____________ Signature: ____________________ Date: ____________

NOTE – Failure by the owner to notify insurers of an impairment or partial isolation of an alarm system or sprinkler installation may void insurance cover.

☑ OWNER SAFETY PRECAUTIONS FOR FIRE SYSTEM SHUTDOWN

- ☐ Forbid smoking in the area affected by the fire system shutdown
- ☐ Stop hazardous processes
- ☐ Where sprinklers are installed ensure they are operative
- ☐ Ensure all smoke stop doors are closed
- ☐ Detail 'FIRE WARDENS' to patrol affected area. (One person per 1000 m^2)
- ☐ No 'HOT WORK' by any parties while the fire system is shutdown.

NOTE – If your building has smoke detectors be aware that dust, heat, and fumes from building work may activate your fire alarm.

Service company name: ____________ Phone: ____________ Fax: ____________

Any queries, please contact: Name: ____________ Phone: ____________ Cell phone: ____________

Figure H1 – Typical form for notifying that an installation is to be rendered inoperative

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